

D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
				<p>Listed under issue "[individual] indicated that in terms of the wash plant, CVRI is only accounting for coal but that there may be other minerals in the area that we don't know about. The wash plant utilizes certain chemicals that seep into the water table and act as cleaning agents but the [Aboriginal Group] would like to introduce the utilization of new technology to better purify the water that is collected from the wash plant. Innovative technology in water purification can begin to mitigate those impacts faced in the development. The adverse impacts on the environment resulting from dust can further be mitigated through the implementation of such water purification systems. Water contaminated in mine development must be addressed through a bilateral process that includes both the [Aboriginal Group] and CVRI." and under what [Aboriginal Group] wants "Want to know how CVRI will deal with these other potential minerals? Dealing with the issue surrounding water purification is one that the federal department DFO is obligated to address. The Agency along with DFO and the proponent can work collectively to address the issue related to mitigating impacts to the mainstream tributaries that are within the expected areas of development."</p>	February 13, 2013	<p>Surface water quality could be impacted by issues including: 1) soil erosion, sediments entering streams via surface runoff, increased sedimentation of surface waters; 2) leaching of nitrates into surface waters; 3) discharges of water from impoundments to natural watercourses; and effects on end-pit lakes on surface water quality. Several of the responses above detail the mitigation measures to be used to avoid these problems. In addition, the general practice at the CVM is to discharge groundwater entering the Project mine areas to nearby surface water courses after being treated in settling ponds. It has been shown that the quality of groundwater in the two proposed mining areas are similar to groundwater chemistry in present and past mining areas in Coal Valley and of acceptable quality for discharge to surface water bodies. There will be an insignificant impact on surface water quality caused by the discharge of groundwater from the pits. There are two issues with respect to how changes in groundwater chemistry may affect the quality of groundwater in the vicinity of the Project pits. These issues can be summarized as 1) changes resulting from the removal and placement of mine spoil, and 2) changes due to spills and leaks. Toe springs are a characteristic of spoil dumps that are external to the mine pit. Water chemistry of four springs at the toes of major mine spoil dumps in the CVM have been monitored since 2000. All parameters fall within acceptable ranges observed elsewhere in the area. The monitoring of toe springs at CVM has demonstrated that there are no significant impacts from spoil on water chemistry. Hydrocarbon fuels will be present in the Project mobile equipment, vehicles and in bulk storage. There is a potential for spills or leaks of these hydrocarbons. Spills from equipment and vehicles will be the result of accidents. In this situation, there will be rapid response and clean up. The probability that such an event could cause an impact on groundwater quality is remote. The impact is therefore insignificant. And finally, the response in #5 above provides information related to water quality studies of its existing end-pit lakes. These studies provide a good indication of the overall potential of the Project to affect water quality through contamination during coal mining in the manner suggested in the stated concern.</p> <p>CVRI will monitor watercourses within the watersheds to be affected by the Project. Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including:</p> <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval. CVRI is currently working with DFO on completing a conceptual compensation plan for the entire project which identifies the watercourses that will be affected and what compensation will be required.</li> </ul>
				<p>Listed under issue "Cumulative impacts to water, including from emissions and selenium dust. Concern that it is increasing the frequency of disease in the community." and under what [Aboriginal Group] wants "Innovative water purification systems must be implemented into the planning process of the mine operations. The [Aboriginal Group] recognizes the value of the water that is utilized within the development area and through the use of technological applications further assurances and efforts can be made to mitigate the impacts of selenium dust on the water."</p>	February 13, 2013	<p>Selenium presence in the mined rock is low in comparison to other locations in Canada. Hence the opportunity for "leaching" selenium into the water column is low. Release of selenium from rock dumps into surface water has been noted at mountain mines in Alberta and British Columbia. A review of 92 selenium values from the groundwater monitoring wells demonstrate that prior to mining the highest concentration was 0.006 mg/L and the average concentration was slightly above 0.001 mg/L (CR #3, Table 2.3.7). A review of 36 selenium values from the groundwater monitoring wells post-mining demonstrate that the highest concentration post-mining was 0.0013 mg/L and the average concentration was slightly below 0.001 mg/L. The fact that the statistics appear to indicate that selenium concentrations go down after mining in an area is likely just a function of dealing with values that are: 1) close to the method detection limit and 2) can vary naturally in the order of several micrograms per liter. The appropriate interpretation is that there is no indication that mining affects selenium concentrations in groundwater. In the 35 years of mining, the CVM has not had any major issues related to selenium concentrations.</p>
				<p>The TLU report stated "Although, medicinal plant life may be short term and minimal, the impact toward the wildlife habitat may be long term since the expansion project is expected to last up to twenty years."</p>	2007	<p>CVRI's impact to the Project area will not be permanent, and it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group D, to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time.</p>
				<p>The TLU report stated "There were some concerns regarding the displacement of wildlife during the proposed project. The area has numerous wildlife habitats, including grizzly, bear, moose, elk, deer, beaver, rabbit, wolverine, fox, ducks, geese and fish."</p>	2007	<p>The development of the Project, particularly the development of the mine pits, soil and rock stockpiles, dumps, and roads, will definitely impact plants and animals in the disturbance zones through displacement. Most wildlife will likely be displaced to adjacent habitat patches. Ungulates will be temporarily displaced by active mining as they are unable to cross a pit disturbance. This displacement will be restricted to local use as there are no indications of long distance or major seasons migrations in the LSA. Large amounts of moderate quality moose habitat is available throughout the RSA for moose thereby moderating the affect of habitat change caused by mining. High quality moose habitat on the Project and other areas associated with mixed wood of the Lovett Ridge will be reclaimed with a closed forest regeneration forest of lesser habitat quality. The impacts of the Project development on moose in the region can be mitigated by: implementing reclamation techniques appropriate for moose, establishing a variety of vegetation types and promoting understory complexity in regenerated forests that includes willow species, aligning reclamation and other re-vegetation efforts to maintain and improve moose habitat, taking steps to ensure core security areas are provided for wildlife, implementing appropriate monitoring, cooperating with the province and other industry on access management and other relevant management issues. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. It is expected that elk and deer will respond positively to the early stages of upland reclaimed and re-vegetated areas on the LSA particularly in the Robb West, Main and Central zones where there is extensive mixed wood and deciduous habitat adjacent the disturbance area. The impact of mining development will involve direct mortality through clearing and loss of habitat during mine development and changed composition in small mammal communities in the early stage of reclamation. Small mammals will be temporarily displaced by active mining as they are unable to cross a pit disturbance. Other forest dependent small mammals (red squirrel, snowshoe hare) will be expected to use the regenerated forest and its understory once it becomes established. Understorey development is a necessary component of snowshoe hare habitat. The density of small mammals in reclaimed grasslands has been shown to be similar to undisturbed habitats (Hingten and Clark 1984). After initial grassland establishment, the number of small mammal species is expected to be similar to those on undisturbed similar habitats. Wolverine status is listed as transient/migrant and abundance as rare in the study region. The wolverine is listed as "may be at risk" under Provincial Status (2010) and as "special concern" Federally Listed under COSEWIC. The Red Fox status is listed as a permanent resident in the study region but with a scarce abundance. The Provincial Status (2011) for the fox population is listed as "secure". Muskrat and beaver have been observed using the reclaimed lakes on the CVM (Bighorn 1995:24). Many of the species on the CVM are birds associated with water habitats which would have been poorly represented in the pre-development ecosystem. While bird abundance and types of species may change as a result of mining activity it appears that the number of bird species will be similar or may increase as a result of adding new habitats e.g. upland grassland, shrubland, lake, pond and wetland development. The edge associated with the Project should enhance tree growth potential both natural and through reclamation planting as well as promoting maintenance of bird species occurrence during active mining. Reclaimed lakes and ponds on the CVM support breeding water birds, i.e., Canada Goose, Mallard, Bufflehead, Common Goldeneye, Barrow's Goldeneye, Killdeer, Greater Yellowlegs, Spotted Sandpiper; probably or possible breeding water birds i.e., Ring-necked Duck, Lesser Scaup, Solitary Sandpiper, summer visitants i.e. Common Loon, Osprey, and several species of waterfowl and shorebird migrants not seen elsewhere in the RSA, i.e., Semipalmated Sandpiper, Western Sandpiper, Least Sandpiper, Baird's Sandpiper, Short-billed Dowitcher. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features.</p>

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12	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impact on wildlife in Project area	The TLU report stated "Future construction activities in mine operations and hauling activities in project area will cause some impact to wildlife and medicinal plant life in the proposed areas."	2007	Hauling has the potential to impact wildlife through collisions and emissions including dust. Haul trucks to be used have a maximum speed of 60 km/h. Potential direct mortality through vehicle collisions is not expected to be a problem as haul roads are typically wide (approx. 30 m) and provide a good field of view for operators and wildlife. Truck travel is slower (areas of 30 km/h and areas of 60 km/h) than highway speeds. Haul truck operators at the CVM are experienced drivers. All mine vehicles using the haulroad are radio-equipped. It is standard operating practice for operators to advise other operators if a road hazard is encountered including wildlife on the road. CR#1 (Air Quality Assessment) concluded that combustion emissions on public roads (SO <sub>2</sub> , NO <sub>x</sub> , CO, PM <sub>2.5</sub> ) are lower than emissions from CVM haul road operations (Tables 4.1-12 to 4.1-15). SO <sub>2</sub> emissions from public roads are 17% of total haul road emissions from Robb West and Robb East and NO <sub>x</sub> emissions from public roads are 2% of Project haul roads. CO emissions from public roads emissions are 15% of Project haul roads. Gravel or crushed rock is used on the haul roads. Gravel is observed to produce less dust than clay and sandy surfaces. In order to mitigate dust, water will be applied to haul roads operated by CVM. In summer, the assessment assumed that water will be applied to haul roads operated by CVM and calcium chloride (CaCl <sub>2</sub> ) will be applied to the stretch of Highway 40 south of Coalspur (CaCl <sub>2</sub> is applied twice a year by Alberta Transportation and Utilities). Application of water or CaCl <sub>2</sub> is assumed to have 80% dust suppression efficiency, as used in previous air quality assessments in other mine areas in Alberta (Cirrus, 2002). Water is systematically applied to haul roads to minimize dust using a water truck dedicated to this purpose. An emission control efficiency of 80% during the summer months is expected from this measure. Snow cover is retained on the road as a mitigative measure during the winter months, unless the cover would compromise the safety of vehicle operations. Winter ground is frozen and, since the soil and overburden have elevated moisture contents, there is significant reduction of dust emissions at that time. Although hauling will negatively affect nearby resources, the Air Quality study concluded that the effects were insignificant. Overall, residual air quality impacts relevant to the Project were considered to be low for several reasons. Project contributions to predicted concentrations at the RSA MPOI and at local receptors were typically very small in an absolute sense. The addition of the Project did not result in exceedances of the CWS and AAAQOs or odour thresholds. All Project air quality impacts are reversible and the ambient air quality is expected to revert to its original state after the Project ceases to operate. Other impacts to wildlife and vegetation from the Project are addressed in numerous other responses in this table.
				Stated "they are going to be all kinds of wildlife disturbances. I'm concerned about calving grounds of moose/elk, how we going to manage that wildlife seem to follow mines."	March 25, 2008	Low calf moose numbers are generally attributed to wolf predation, lack of forage, increased access leading to increased hunting and die-off related to ticks. Mining and forest harvesting may result in temporary displacement of local populations but the RSA is characterized by a large amount of moderate quality moose habitat. An examination of elk observations during Fish and Wildlife moose surveys in the area on the north side of the existing CEA study area indicates scattered elk in low numbers. There is not a substantive elk population in this area. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features. CVRI also aims to maintain as much undisturbed habitat as possible during mining will help to enhance the wildlife diversity of the reclaimed sites. The future management of the reclaimed areas, including access for hunting and the management of ungulate populations, will be the responsibility of AESRD.
				"Q.34 What are the effects on birds and other wildlife from the loss of forest by the combined CVRI and FMA holder activities? If there are negative effects why has CVRI not proposed to purchase the FMA rights to offset habitat losses and prevent potential cumulative adverse effect as parts of its negotiations with West Fraser referred to in s. E "	April 2008	CVRI works with the FMA holder (West Fraser) to determine appropriate clearing plans to reduce overall footprints. Cut blocks are coordinated with upcoming mining activity whenever possible to maintain as much undisturbed forest habitat as possible. Once the mine removed the vegetation the FMA rights are compensated and the land is take over by CVRI under there permit boundary and lease. CVRI cannot remove other FMA holder lands by simply purchasing them for offsetting habitat losses. Conversations with West Fraser continue to make sure both parties can obtain resources in the most environmentally responsible way.
				"Q36. What if any baseline studies, have been done on animal health in the area"	April 2008	<p>In support of the application, baseline wildlife surveys were completed. These surveys included collecting data on all existing wildlife resources (amphibians, reptiles, birds, and terrestrial and aquatic mammals) and their use of habitat in the study area(s). Tasks completed for the wildlife assessment included:</p> <ul style="list-style-type: none"> <li>• identify relative abundance, concentration areas, distribution patterns, and habitat associations of ungulates by means of winter aerial surveys, snow track-counts, and a spring pellet-browse survey;</li> <li>• identify small mammal, avian and amphibian presence, relative abundance and habitat association by means of snow track-counts, trapping small mammals, owl surveys, spring bird survey, breeding bird survey, migration survey, and amphibian survey;</li> <li>• compile a list of vertebrate species (excluding fishes) and identify their status as per the Committee on Endangered Wildlife in Canada (COSEWIC), the Canadian Endangered Species Conservation Council (CESCC 2006) and the General Status of Alberta Wild Species (ASRD 2005);</li> <li>• prepare a habitat map to identify the quantity and quality of habitat present in the Project Development Areas;</li> <li>• update wildlife use of the existing CVM by means of aerial survey, systematic monthly ground surveys, spring pellet-group counts, breeding bird survey and amphibian survey;</li> <li>• identify Valued Environmental Components for assessing the potential impact of the proposed development on ungulates, small mammals, birds and amphibians;</li> <li>• discuss biodiversity at the LSA and RSA scale;</li> <li>• review Traditional Use Studies (TUS) prepared for CVRI from a wildlife perspective;</li> <li>• discuss climate change with respect to changes in the Boreal-Cordilleran ecoregion that may affect wildlife; and</li> <li>• evaluate the potential impacts of the Project within a temporal and spatial perspective that incorporates existing and future demands by other users and developments by conducting a quantitative cumulative effects assessment for elk.</li> </ul> <p>This extensive background data collection provided the application with a good indication of wildlife health. See below for additional information on animal health.</p>
				"Q36. What if any baseline studies, have been done on animal health in the area"	April 2008	Through its consultation efforts, CVRI is aware that many Aboriginal groups are concerned about the effect of industrial development on wildlife health. They report cases of diseased animals that when butchered are found unfit for consumption, and many attribute this to industrial development. This has even led to research studies into animal health supported by several Treaty 6 First Nations. And of course, Alberta Fish & Wildlife (AESRD) studies numerous animal health issues including Chronic Wasting Disease (CWD), White-nose Syndrome, West Nile Virus, mammalian skin tumours, and numerous others. They have established programs to track, understand, and manage many of these. CVRI recommends that Aboriginal groups continue to press the Provincial Crown and other industrial players on the potential link between industrial activities and animal health. As for Robb Trend Project potential effects on animal health, a discussion of these is found in CR#5, Human Health, Appendix F: Screening Level Wildlife Risk Assessment (SLWRA). This assessment looked at any potentially harmful substances that could be associated with the Project such as air contaminants, heavy metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and others that could be released into the air, or otherwise make their way into soils or surface water, and then be breathed in or eaten by animals. In order to err on the side of caution, the study assumed that potentially affected animals would be exposed to maximum potential adverse effects from the air for their entire life cycle, and that the Project would last 80 years instead of 25. The assessment concluded that predicted acute exposures to the substances through the air would not have an adverse effect on either avian or mammalian wildlife in the region. It was also concluded that predicted chronic exposures to the substances through the air would not have an adverse effect on mammalian wildlife in the region. Most predicted soil concentrations for these substances are not expected to have an adverse effect on wildlife populations in the study area. However, some metals identified during the screening indicated a possible concern under only one of the several screening guidelines, and resulted in more in-depth analysis. This analysis indicated that these metals will be within the typical range of levels across Alberta, and therefore comparison of predicted soil concentrations to background levels indicated that wildlife are not likely to be at any greater risk in the RSA than other populations across Canada. In all instances, the long-term surface water concentrations of the substances are not anticipated to adversely affect wildlife populations in the region. The results of the SLWRA indicate that the overall risks posed to wildlife health from the Project will be low. Therefore, no impacts to wildlife populations are expected based on estimated wildlife exposures to predicted maximum acute and chronic air concentrations and measured soil and surface water concentrations. The confidence in the prediction is high since highly conservative assumptions were applied in the SLWRA. CVRI will continue to work with government agencies, Aboriginal groups, and others to monitor and mitigate against potential effects to animal health in the region.

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				"Q.37 What, if any, studies on animal health have been done with regard to current and past CVRI mines?"	April 2008	Wildlife monitoring is common practice at all CVRI mines to various degrees of complexity. All CVRI projects required to provide baseline wildlife data and ongoing monitoring occurs with wildlife cameras and survey counts identifying what habitat (pre-mine, during mining, post-mine, reclaimed) is used and to what degree. As noted above, CVRI does not expect that the Project will have any effect on animal health.
				"Q.38 Why has CVRI not committed to a Wildlife Compensation Program to address the relatively long "short term" effects of the Project on wildlife?"	April 2008	A variety of wildlife uses on undisturbed and reclaimed habitat associated with coal leases during and after the mining phases has been documented. Wildlife have colonized new habitat created by reclamation of coal mines (MacCallum 2003). Activity associated with mining is predictable and focused. Animals are not subject to random and varied human disturbance within the MSL. These conditions allow animals to colonize the reclaimed landscape. The MSL associated with the CVM has provided a secure environment for wildlife and is instrumental in maintaining regional ungulate populations especially in the Critical Wildlife Habitat associated with the Lovett Ridge. Initial displacement of the existing wildlife community on the Project LSA by active mining will be followed relatively quickly by colonization of wildlife species appropriate to the stage of succession reached by the regenerated plant community. Given that appropriate habitats are established and movement opportunities are designed into the Project disturbance, wildlife are expected to adjust to the initial displacement and disturbance by colonizing newly available habitat and incorporating it into their daily and seasonal activities.
				Environmental monitor stated in TLU report "Wildlife will lose a lot of forest they use to survive.", Elder stated in TLU report on suggestions to reduce impacts, "Just the medicines and berries, and the bear den. Try to protect them by not using machinery near or around the creek and bear den."	October 2011	A minimum 30 m buffer is maintained around all watercourses and if an important wildlife component (nest, den, rearing area) is identified, site specific mitigation will be implemented that could include time restrictions.
13	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impact to environment	The TLU report stated "It was suggested that any major development into the area would definitely have impact on wildlife, berry growth, medicinal trees and plant life."	2007	The Project will affect wildlife and vegetation in the area but for short periods of time until reclamation activities can establish productive terrain. It should be noted that the Project is completed over a number of years and not all the lands will be disturbed at one time. CVRI promotes progressive reclamation and when the opportunity exists the mine will start to recontour and reclaim mined out lands as soon as possible. Mining is a temporary use of the land and reclamation activities aim to make this time as short as possible. This is detailed in the response to #1 above.
				Environmental monitor stated in TLU report Recommendations "Less impact to land, game trails and vegetation by machinery or quads."	October 2011	Disturbance footprints are minimized as much as possible to decrease the overall effect on vegetation, wildlife and various other factors. CVRI also aims to maintain as much undisturbed habitat as possible during mining which will help to enhance the wildlife diversity of the reclaimed sites.
				Environmental monitor stated in TLU report "Beautiful land will be destroyed forever." and "Disturbance will have a large impact"	October 2011	CVRI's reclamation objective for the CVM is to reclaim mined lands to meet equivalent land capability with the intended end land uses. The achievement of this objective assures that mining is a temporary use of the land. Reclamation of the land is detailed in many of the above responses.
				"Comment 14: The Application should identify whether or not the on-site storage of coal, catalysts and chemicals, products, by products, intermediates and wastes will also be used for the Robb Trend portion of the project. If they are, the Application should quantify the amounts associated with each of the three portions of the project."	April 11, 2007	
				Stated under issue "Selenium dust – According to [individual], CVRI is denying it is out there but he argued it is a problem in the project area. Selenium comes up in several different sections of the EIS (e.g. CR3- Hydrogeology, CR10 – Soils, CR 11 – Surface Water Quality).", and under what [Aboriginal Group] wants "We have no idea of the adverse effects of selenium and as such the [Aboriginal Group] would further request that direct technical support and resources be provided to the [Aboriginal Group] that will allow them to address this matter. Through cost sharing the Agency and the proponent can clarify the effects of the selenium dust on the environment and further ascertain the direct impacts of the selenium dust on the [Aboriginal Group] inherent right to gain access to the traditional livelihood."	February 13, 2013	CVRI's response to selenium concerns is discussed above in response #11. CVRI's studies indicate that there will be no impact from selenium, and therefore no impact from such on Treaty Rights and traditional uses in the area. CVRI cannot respond to the request for additional funding to Aboriginal Group D from Federal agencies to study the issue of selenium, but will not provide additional funding as the proponent for such work.
14	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	impact to rare plants	Stated "There is a plant on the CERA list for extinction up there, guy from [other Aboriginal Group] said"	March 25, 2008	In total, 574 vegetation species were documented during field surveys within the LSA. Of these, 345 were vascular and included 9 trees, 62 shrubs, 193 forbs and 81 graminoids, and 229 were non-vascular and included 134 bryophytes and 95 lichens. Forty-six vegetation species documented during field surveys in the LSA are on the ACIMS Alberta Rare Plant Tracking and Watch Lists (Table E.13-5). Of these, 20 are vascular plants (with 38 occurrences), 18 are bryophytes (with 40 occurrences), and 7 are lichens (with 9 occurrences). Additionally, one occurrence each of Chrysosplenium iowense (golden saxifrage), the crust lichen Lecidea leprarioides, and Conocephalum conicum (snake liverwort) were observed within 500 m outside the LSA boundary. The results of baseline field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List. No plants observed in the Project area are listed as potentially being extinct. The comment provided may be referring to a new, and rare species of orchid documented in the Marlboro area, far outside of the Project area.
				"Q11. Since Aboriginal people have a heavier reliance on country food such as fish, and there may be a risk associated with long-term high consumption, will CVRI commit to conducting a baseline health study on Aboriginal people using or living in the area and monitor the health impacts"	April 2008	Studies of Human Health impact (CR#5), including Aboriginal receptors utilizing a subsistence diet in the region, indicate no substantial Project-related health risks due to exposure to, inhalation, or ingestion of chemicals, toxins, carcinogens, or harmful non-carcinogens. No adverse health effects are expected for the region. CVRI will continue to implement monitoring of air, surface water, and ground water to help mitigate any potential effects. Given the distance of Aboriginal Group D from the Project area, potential impact to a member of that community through dietary intake cannot reasonably be expected to exceed the conditions as laid out for an Aboriginal receptor in the study of human health.

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15	Potential Impact to Treaty or Aboriginal Rights	Health	impacts to Aboriginal health quality in surrounding region	"Q12. Will CVRI commit to consulting with [Aboriginal Group] on water quality monitoring to ensure there is no health risk from mercury consumed in fish?"	April 2008	Responses #5 and #11 provide a discussion of potential impacts from mercury and selenium respectively.
				"Human Health- The people of the [Aboriginal Group] generally have a higher reliance on local sources of food such as fish, berries, plants and game, and accordingly have concerns about human health impacts of them. To date, no information has been provided by CVRI suggesting that a baseline health study has been conducted on the [Aboriginal Group] people, nor has any indication been given regarding the risk associated with high long-term consumption of local sources of such food. Accordingly, The [Aboriginal Group] is concerned particularly for the health of its people, and proposes that it should be informed of any potential associated risks and that suitable steps to be taken to minimize such."	July 16, 2008	Responses #5, #11, and a response above provide a discussion of potential impacts from mercury, selenium, and wild resource consumption respectively. The withdrawal of a statement of concern submitted by Aboriginal Group D regarding previously proposed CVRI mine extensions, including this specific concern, is a strong indication that the proposed mitigations and relationship established have addressed general concerns about impacts to Treaty Rights and traditional uses in the Project area.
				Chief stated that they would like to look at the cumulative effects on [Aboriginal Group], he stated that "coal dust affects everything out there"	July 8, 2009	The CVM does produce NOx and particulate emissions, but at the ROM stockpile at the Plant, dust emissions result from the unloading of raw coal dust from trucks and from wind erosion. There were also emissions related to the loading of raw coal on the loading bin. At the clean coal pile, emission sources include wind erosion and dropping the excess clean coal from the conveyor outside of the stacking tube. The rest is accumulated in two closed silos and/or is loaded directly onto the train. CVRI does implement dust suppression to mitigate for coal and road dust sources. The coal that is placed and or in the train cars has a fairly high moisture content to help in dust suppression. Train cars are not filled to levels that would be susceptible to wind erosion and if moisture content is low the coal piles can be sprayed with water to reduce wind erosion.
16	Potential Impact to Treaty or Aboriginal Rights	Health	noise pollution	"Noise- The [Aboriginal Group] is concerned over the impact that noise from explosives will have on areas surrounding the proposed mine expansion area. Although admittedly the immediate effects from blasting will only be of short duration, the mitigation of disturbance to animals and residents in the area does not appear to have been addressed by CVRI other than to state that residents will be notified prior to blasting. The [Aboriginal Group] is concerned that such notification will not help to minimize impacts of blasting, and states that alternative methods of blasting exist that would minimize noise disturbance. "	July 16, 2008	The noise and vibration levels associated with blasting are typically a cause for concern by nearby residents and can disturb wildlife. Blasting will be conducted on weekday afternoons and the utilization of smaller more localized blasts will be implemented to reduce noise levels and the amount of explosive being used. As mentioned above, ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. The withdrawal of a statement of concern submitted by Aboriginal Group D regarding previously proposed CVRI mine extensions, including this specific concern, is a strong indication that the proposed mitigations and relationship established have addressed general concerns about impacts to Treaty Rights and traditional uses in the Project area.
17	Potential Impact to Treaty or Aboriginal Rights	general traditional use	Interest in environmental monitor	Chief stated [Aboriginal Group] would be interested in monitoring in an MOU	January 15, 2007	The CVM has active employees whose responsibilities include the environmental monitoring throughout the mine. Other monitoring activities are completed by various environmental consulting companies. CVRI will consider the use of Aboriginal Groups for future monitoring programs. The following monitoring will continue within the Project area and throughout the mine site: <ul style="list-style-type: none"> <li>• groundwater;</li> <li>• surface water;</li> <li>• air;</li> <li>• noise;</li> <li>• wildlife/aquatics;</li> <li>• vegetation/wetlands;</li> <li>• reclamation; and</li> <li>• regulatory compliance.</li> </ul> An Aboriginal Group D liaison position exists at the mine. The scope of this position can be expanded to a role in the environmental monitoring of CVM operations.
				Chief expressed that Alexis would like a monitor to look at site on a monthly basis and be part of the advisory committee	July 8, 2009	
				Expressed interest in having a full-time environmental monitor from [Aboriginal Group]	April 26, 2011	
				Expressed interest in having a full-time environmental monitor from [Aboriginal Group] for the mine	October 5, 2011	
				Raised as recommendation in TLU report for ongoing monitoring of project area	October 2011	
18	Socio-economic impacts	Socio-economic	other	"The [Aboriginal Group] is specifically concerned about the lack of study by CVRI of socio-economic impacts on its people, separate and distinct from the communities of Edson, Hinton, Robb and those areas of Yellowhead County studies. Specifically, the [Aboriginal Group] is concerned over the social impacts on its members due to the mine expansion, but also economic impacts or opportunities facing its members. To date, no further reported information forms the basis of CVRI's application in this regard. The [Aboriginal Group] states that further studies should be conducted with its members to this end to minimize potential adverse effects and to develop mutually beneficial opportunities between the parties."	January 15, 2007	The Project is not a new enterprise but an undertaking that will allow the continuation of an existing venture. Employment is expected to remain roughly constant to current levels, therefore, population and social conditions in the local or regional area are expected to stay fairly static. An agreement is in place between CVRI and Aboriginal Group D that is focused on a cooperative relationship including the establishment of employment and contracting opportunities. The liaison for this agreement is active in bridging between the community and the mine operation through regular meetings, communicating job openings and employment resumes, plus representing and promoting community contracting capacity.
				"A particular concern is held over ongoing communication and consultation between it and CVRI. Especially, the [Aboriginal Group] would ask that the ERCB order that CVRI consult continually with the [Aboriginal Group] as a condition of this application, if granted."	January 15, 2007	
				Expressed that the Nation would like capacity funding for TUS studies and socio-economic impacts	March 15, 2007	
				"Comment 11: The Application should describe how the Proponent intends to consult with the [Aboriginal Group] on environmental management plans and on-going monitoring and adaptive management."	April 11, 2007	
				The TLU report stated "It was stated that more women elders take part in the assessments for medicinal purposes. It was indicated that women are apt to identify more medicinal plants."	2007	

D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
19	Consultation	Consultation	Consultation	<p>The TLU report stated "Finally, the monitors suggested that for future environmental assessments based on traditional knowledge that more elder monitors be recruited to enhance the assessments."</p> <p>The 2007 TLU report stated "The elder monitors recommended that the environmental assessment based on their traditional knowledge needed more time to complete a thorough assessment and cover more ground area to see everything. They indicated suitable timeframe is important to make a complete and thorough assessment."</p> <p>Sent a letter requesting additional TLU studies for [Aboriginal Group] as recommended in [consultant's] review of the EIA.</p> <p>Chief stated that he disagreed that TLU studies had been completed and stated "the position I have to reiterate is the core of cumulative effects, everything is not okay, [Aboriginal Group] is different in terms of engagement, we have lands out there, makes us different, since 1996 we have been guaranteed reserve lands."</p> <p>Chief stated "we need to deal all coal companies the same way, I think meeting every 6 months with council, once a year with community, Premier has indicated will be re-looking at consultation, need to get it concrete, not meaning to be adversarial, but need to let you now how we want to be engaged"</p> <p>Chief stated "consultation has to be on-going, I cant give one-time approval for something to go on for 25 years"</p> <p>Chief stated "company comes with intent to get approval from [Aboriginal Group], not in [Aboriginal Group] best interest, wanted to point out Dan is anthropologist/credited to document doesn't show everything that [Aboriginal Group] said they wanted, just keeping records to show they talked to us, are you satisfied? My question is what have you learnt from our policy, have you incorporated it? You brought tobacco which is good, do you feel in your own procedures you have done all you need to do to get approvals?"</p> <p>Elder stated "I don't think the whole idea is just trust, we all gotta live. We live here, we can't meet once and forget it. We hunt here, roads we can't use in future. Trust is not it alone. We have to respect each other."</p> <p>Councillor stated how agreement with another company was not followed through. They stated "Looked good at the time. Trust, and they are not fulfilling that agreement, we don't want the same to happy with you. We learned from the last."</p> <p>Stated "We do need something on paper. But once we signed (with another company) they turned their back on us."</p> <p>Addressed that the Robb Trend West area would need additional TUS studies</p> <p>Discussed that the Robb Trend West area would need additional TLU work</p> <p>Raised concern that the Robb East portion had not been finished in the TLU studies</p> <p>Expressed that [Aboriginal Group] would like to see money for traditional use</p> <p>Chief stated "If footprint or licenses changes, we need to be notified to see how it affects us"</p> <p>Expressed concern that TLU studies should not be done at one time and should be on-going.</p> <p>Expressed interest in funding for GIS capacities for additional TLU studies</p> <p>Expressed there was no GIS funding at the [Aboriginal Group] and was needed for additional TLU work</p> <p>Noted that [Aboriginal Group] needs internal funding for mapping capacity including training in ArcView and equipment for map production.</p> <p>Expressed that [Aboriginal Group] was concerned that the Robb Trend Application was being submitted before [Aboriginal Group] concerns had been mitigated</p> <p>In letter from [legal counsel] stated "I have been requested by [Chief] to contact you to request that you provide to our offices with a copy of the proposed Application to the ERCB...The reasons for our request is to have the opportunity to review it before filing and allow [Aboriginal Group] the opportunity to provide feedback in respect to all matters relating to the impact that the project will have on their Treaty Rights.</p>	<p>2007</p> <p>2007</p> <p>May 26, 2009</p> <p>July 8, 2009</p> <p>July 8, 2009</p> <p>July 8, 2009</p> <p>July 17, 2009</p> <p>July 17, 2009</p> <p>July 17, 2009</p> <p>July 17, 2009</p> <p>April 26, 2011</p> <p>August 6, 2011</p> <p>October 12, 2011</p> <p>October 12, 2011</p> <p>October 31, 2011</p> <p>March 2, 2012</p> <p>February 28, 2012</p> <p>March 2, 2012</p> <p>March 15, 2012</p> <p>March 12, 2012</p> <p>March 14, 2012</p>	<p>CVRI has engaged in consultation with Aboriginal Group D on the Robb Trend Project in the spirit of both Provincial consultation guidelines and relevant court decisions since 2006 in order to assess and mitigate any potential impacts to their Treaty Rights and traditional uses of the Project area. CVRI believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in terms of the assessment of its adequacy. Consultation has resulted in a written agreement between the parties that has established a relationship that will witness on-going consultation for the life of the Project, and has addressed many of the concerns raised regarding consultation. CVRI continues to provide capacity funding that will maintain coordination between the parties on issues of concern to Aboriginal Group D, including but not limited to issues of traditional knowledge, contracting and employment opportunities, and other community support. CVRI funded Aboriginal Group D traditional use studies of the Project lands in 2007 and 2011, and has agreed to further studies on its operations in the future where necessary. The 2011 traditional studies were initiated in response to footprint changes associated with the Project and concerns regarding coverage. In all cases, Aboriginal Group D has been responsible for choosing participants in the studies and the preparation and presentation of the results. These studies have been extensive in coverage and have provided meaningful baseline data for the incorporation of Aboriginal Group D traditional ecological knowledge into future reclamation activities. CVRI has similar expectations for any future traditional use studies that are implemented on lands associated with CVRI operations. CVRI is not privy to the precise make-up of the traditional use studies program at Aboriginal Group D, but has provided ample funding to see studies undertaken in support of understanding potential impacts of the Project on Aboriginal Group D Treaty Rights and traditional uses. CVRI has sponsored Aboriginal Group D field investigations and reports for Mercoal West, Yellowhead Tower, and Robb Trend. Subsequently CVRI sponsored Aboriginal Group D field investigations and report for Robb Trend West and the Access Corridors. This work was complementary to the previous Robb Trend investigations. [Individual] has repeatedly expressed his personal dissatisfaction with the methodology applied in these earlier studies which had been completed under the oversight of the lands consultation department. CVRI is unwilling to "redo" this baseline work. The existing agreement includes provisions for on-going "annual" reviews of discrete land disturbance areas with respect to further detailing of "land use." CVRI is following provisions of this agreement as is evident in the on-going plans for "field review" of the 2013/2014 disturbance areas in Yellowhead Tower. [Individual] has also repeatedly expressed his concept of "land use studies" including video recordings, detailed mapping requiring Aboriginal Group D acquisition of equipment, training, and staff. His concept involves detailed digital data acquisition, application of GIS software, and development of capacity within Aboriginal Group D to undertake such work. CVRI maintains that much of the base mapping (topography, soils, vegetation, wildlife, ecosites) have already been completed and remains available. CVRI is not solely responsible for the support and development of Aboriginal Group D's traditional studies program, and suggests that additional funding for that beyond that previously provided be sought from relevant Provincial and Federal ministries. As in the past, Aboriginal Group D has had the opportunity to review CVRI regulatory applications related to the Project, and CVRI has provided capacity funding to assist with the reviews. CVRI is currently awaiting the results of one of those reviews. Given the scope, complexity, and requirements of regulatory filings, it is not possible to allow all parties an opportunity to comment on all matters prior to filing, nor is it reasonable to expect that any and all concerns will be mitigated prior to the submission of an application. As noted previously, CVRI understands that consultation is a process, not a one time event, and the agreement between the parties will help ensure continued discussion of CVRI developments and their potential impact on Aboriginal Group D Treaty Rights and traditional uses, and other concerns raised regarding potential community impacts from and benefits related to the Project. Regarding issues of asserted Aboriginal Title for their "traditional territory" and its recognition by other parties, and the appropriateness of compensation, those are matters that are well beyond the jurisdiction of CVRI, and issues that need to be discussed with the Federal Crown. The Supreme Court of Canada considers compensation to be a specific form of accommodation. Accommodation does not mean compensation as it is often implied, rather it means steps taken to address concerns and reach some form of reconciliation of competing interests. In an extreme case, typically one involving Title infringement, where compensation as a form of accommodation is called for, the SCC has made it clear that it believes any responsibility in this regard lies with the Crown, not third parties (Haida 2004: 55). The issue of Aboriginal Title is a complex legal issue beyond the scope of the present Project application. The Provincial and Federal Crowns' position is that Aboriginal Title in Alberta was extinguished with the signing of the numbered treaties; CVRI is aware of no court ruling or Crown position contradicting this, or evidence suggesting that a credible prima facie claim to Aboriginal Title covering the Project area on the part of Aboriginal Group D could be made. CVRI continues to work with Aboriginal Group D on consultation matters, and views the withdrawal of previously filed statements of concern on its projects and the lack of filing related to the Robb Trend Project as signals that both parties are satisfied that a process is in place to address any current and future concerns related to the Project. This agreement and the on-going consultation must be viewed as the process of reconciliation of competing interests between Aboriginal Group D Treaty Rights and traditional uses and CVRI's use of the land base for mining purposes.</p>

D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
				In letter from [legal counsel] stated "I have been advised by [individual] that the traditional knowledge study report was provided to CVRI last fall and there has been no formal response received to the contents of the report including the recommendations contained therein."	March 14, 2012	
				Listed under issue "The [Aboriginal Group] has made direct reference to the existing agreement relative to Adaptive Management Strategies that has compelled CVRI to incorporate TEK research that will include multi-media applications. This must become an essential tool that will capture pertinent digital data for the entire landscape within the project area. This hands-on approach will eliminate any threats of elder accidents in accessing this rough terrain. The data sets and video that are collected by [Aboriginal Group] environmental monitors can be shared immediately on a daily basis through a presentation of a video that the elders, trappers, hunters and gatherers can all review to clarify their findings. The [Aboriginal Group] must locate and digitize plant foliage. Timing is essential due to the peak growth season. Planning TEK research is essential and budgets will have to be approved on an annual basis. The variable is time and each location must be assessed prior to any dirt work. This includes Mercoal West, Yellowhead Tower, all corridors and the main area of the Robb Trend project area." Listed under what [Aboriginal Group] wants "The [Aboriginal Group] would like to conduct annual TLU studies using the Universal Transverse Mercator (UTM) grid system to map coordinates of traditional vegetation." and, "The [Aboriginal Group] must undertake a progressive mapping strategy to stay one step ahead of each new stage of development within the project area." and "The [Aboriginal Group] will require confirmation from CVRI that this will be a primary feature of operations in future developments in the mine. Inclusive to the IBA."	February 13, 2013	
				Listed under issue "Incorrectly filed information by CVRI: TEK/TLU studies in EIS document do not cover the entire project area. Studies only include haul roads. Work done in 2006 when the proponent was applying for the Mercoal West and Yellowhead Tower mines." Stated under what [Aboriginal Group] wants "Want to do baseline TLU studies (also referred to by [individual] as "Environmental Monitoring") for the entire project footprint to quantify and map traditional vegetation (herbs, medicines, berries) that may be present and that will be destroyed as a result of the project. This information will help the [Aboriginal Group] quantify what is being lost as a result of the project and clarify the correlation to accommodation through compensation for the loss of access to traditional livelihood as it is stated in the existing treaty (hunt, gather and fish) previously negotiated with the Crown. Further, the affirmation of aboriginal title by the [Aboriginal Group] in relation to the traditional territory is recognized by other first nations, governmental departments and industry partners. As well, TEK information can assist in reclamation works."	February 13, 2013	
20	Regulatory Process	other	other	"Comment 1: The Application should fully describe the reasons for submitting separate applications for portions of the same project and why this should not be considered as environmental assessment "Project Splitting"- a practice that is contrary to acceptable environmental impact assessment."	April 11, 2007	In Alberta, the coal industry is a two stage approval process. First a mine permit is applied for which allows a proponent to secure the lands required for a project. A mine permit essentially is the regulators approving the project idea but no disturbance is allowed. Once a mine permit is approved the proponent can apply for a mine licence which will allow for land disturbance and mining to occur. The Application that was supplied to the regulators (ESRD, ERCB) for review followed the Terms of Reference that were issued by the government to CVRI. The Application included all the necessary information to apply for a mine permit boundary for the project. Consultation is an ongoing process. The sooner a proponent can make future plans aware to stakeholders the better. A lengthy consultation period is beneficial to better educate stakeholders about the Project and to identify concerns and mitigation strategies to resolve them. The Robb Trend Project was identified during the Mercoal West - Yellowhead Tower Application in 2008 to let stakeholders know about the potential development and how it related to other mine areas within the CVM. CVRI fails to understand how very early notification to the public and Aboriginal groups of its potential plans for the Robb Trend Project can be considered a "flaw." CVRI has engaged all parties including Aboriginal Group D from those early planning stages, indicating a commitment to be open about the planning and regulatory process.
			"Comment 2: The Application should clarify why the Public Consultation Program included the Robb Trend portion of the Project for which separate terms of reference and an application are to be developed."	April 11, 2007		
			"Comment 3: The Application should assess the degree to which the Public Consultation Program, by including the Robb Trend portion, was potentially flawed."	April 11, 2007		
			"Comment 4: The Application should contain a full tabular matrix of public and First Nation comments and concerns raised and how they have been addressed."	April 11, 2007	Section G and Appendix 7 of the Application contain the public engagement comments and concerns. Consultant Report #12 captures the comments and concerns raised by Aboriginal Groups. An earlier SIR response provided a more generic breakdown of these concerns in order to respect confidentiality issues associated with Aboriginal groups. This table provides a more detailed breakdown of those concerns as requested by Regulators in their review of the Project Application.	
			"Comment 9: The Application should describe clearly which components, etc. of the Mercoal West and Yellowhead Tower portions overlap with the Robb Trend portion of the project."	April 11, 2007	The Robb Trend Project represents an extension of CVM's mining footprint into a new area, otherwise using the existing mine plant and other infrastructure. The Robb Trend project does not overlap the Mercoal West and Yellowhead Tower project from a land stand point but similarities exist when speaking about machinery, use of the existing wash plant, workforce, general geology/vegetation/wildlife and mining/reclamation techniques. As Aboriginal Group D entered into a long-term agreement with CVRI and withdrew its concerns related to Mercoal West and Yellowhead Tower, CVRI believes that any overlapping concerns have previously been addressed to the satisfaction of Aboriginal Group D.	
			"Comment 10: The Applications should describe how management plans for all three portions will be integrated, and, if the environmental management plan for the Robb Trend portion is different, whether and how the management plans for the first two portions will be changed to ensure consistency."	April 11, 2007	The Robb Trend Project represents an extension of CVM's mining footprint into a new area, otherwise using the existing mine plant and other infrastructure. The environmental plan for the Robb Trend project will be dependent on the ESRD EPEA Approval that would be issues at the licensing stage. Common environmental practices and procedures will remain and if required improved upon.	
			"Comment 12: The Application should clarify whether subsection 4.1 c) refers to the Robb Trend portion of the Project. It should also clarify whether or not the Mercoal West and Yellowhead Tower portions would be economic, or would not be proceeded with, if the Robb Trend portion was not approved."	April 11, 2007	The Mercoal West mine area is currently active and approaching completion (Phase 2 was approved in late 2012). The Yellowhead Tower mine area is also currently active and further development is planned (Phase 2) for 2014.	
			"Comment 18: The Application should clearly indicate which of the three assessment scenarios includes consideration of the Robb Trend portion of the project."	April 11, 2007	See above,	
			"Comment 21: The Application should explain and provide a rationale for any information deficiencies that limit or make the cumulative effects assessment uncertain that are under the Proponent's direct control, i.e. The Robb Trend portion of the Project"	April 11, 2007	As explained above the Mercoal West and Yellowhead Tower projects are active and no information deficiencies exist relating to Robb Trend. The Robb Trend Project was submitted as a separate complete application focused on meeting all of the Terms of Reference. The potential cumulative effects of the Robb Trend are assessed in numerous places in the Application.	

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21	Potential Impact to Aboriginal Heritage	Historical Resources	requests for information on location and nature of recorded Historical Resources in the Project area	Councillor stated "the artifacts you come across, this is something we'd like to be involved with, we want to open an interpretive centre"	October 31, 2011	Artifacts and the sites on which they are found are considered to be historical resources in Alberta. The management of historical resources in Alberta is governed by the <i>Historical Resources Act</i> and administered by the Provincial Crown (Alberta Culture). Provincial authority to regulate all historical resources has been supported by past Supreme Court of Canada decisions, most notably <i>Kitkatla Band v. British Columbia</i> (2002 SCC 31). Although CVRI has shared some general information regarding its Historical Resources Impact Assessment studies with both Aboriginal groups and the public, regulations under the Act limit information sharing on the part of CVRI and its consultants in order to help protect extant significant sites and any associated information and artifacts. Any questions regarding historical resources and artifacts should be directed to the Head, Archaeological Survey of Alberta, Historical Resources Management Branch, Alberta Culture.
22	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	<p>Overall comments by [Aboriginal Group] members included interest in employment opportunities at the mine</p> <p>Chief stated that employment opportunities need to be looked at in MOU</p> <p>Expressed that Alexis First Nation would like to see funding for economic development including training, employment and contracting</p> <p>Expressed interest in discussing contracting and employment opportunities for [Aboriginal Group]</p> <p>"What, if any, Aboriginal Employment and Retention Programs has CVI instituted or considered to improve its Aboriginal employment numbers beyond 33%"</p> <p>[Legal counsel] asked about job opportunities for [Aboriginal Group] and joining of union</p> <p>Expressed interest in job opportunities for [Aboriginal Group]</p> <p>Expressed [Aboriginal Group] would be interested in employment opportunities</p> <p>Expressed that Chief and Council would like to see job opportunities for the [Aboriginal Group].</p> <p>Elder stated in TLU report as recommendation: "Meaningful employment for first nation people (contract, or part-time, or fulltime)"</p> <p>Stated "I would like to say here for our community, we are looking for jobs, a lot of educated people in community and accountants, environment, security...other people we work with have their own aboriginal liaisons, hire one of our people, give our people a chance"</p> <p>Discussed employment opportunities</p> <p>Expressed interest in creating Plan of Action to address full-time employment, summer student positions and contracting opportunities</p> <p>Expressed interest in creating Plan of Action to address full-time employment, summer student positions and contracting opportunities</p> <p>Chief and Council discussed interest in employment opportunities</p>	<p>August 10, 2006</p> <p>January 15, 2007</p> <p>March 15, 2007</p> <p>March 25, 2008</p> <p>April 2008</p> <p>July 8, 2009</p> <p>April 26, 2011</p> <p>October 5, 2011</p> <p>October 18, 2011</p> <p>October 2011</p> <p>October 31, 2011</p> <p>February 28, 2012</p> <p>February 28, 2012</p> <p>March 1, 2012</p> <p>May 4, 2012</p>	<p>CVRI and Aboriginal Group D have entered into a long-term agreement written in part to address concerns regarding Aboriginal employment at the mine brought up from the initiation of consultation activities in 2006. The issue of worker retention at the mine, including that related to Aboriginal Group D or other Aboriginal groups, is complex. Nonetheless, working with their liaison from Aboriginal Group D, CVRI continues to make efforts aimed at improving employment with this Aboriginal group associated with CVRI operations, both in terms of direct hiring and potential contracting opportunities for Aboriginal owned businesses. Particularly given its distance from established Aboriginal communities, CVRI can only be considered to be one of the options for improving Aboriginal Group D unemployment issues. Aboriginal Group D must continue to pursue other options not only with other industrial players in the region, but must continue to press the Provincial and Federal Crowns for assistance on this important matter. Using existing resources and working under the agreement between the parties, CVRI expects to be able to make more positive impacts regarding Aboriginal Group D employment in the future, which is one of the responsibilities of the liaison position with the mine.</p>

D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
				Stated under issue "Worker retention is poor at this coal development." and under what [Aboriginal Group] wants "More community support is required and the CVRI management team must allow for a secondary aboriginal human resources representative to work in the mine who can maintain a direct link to HR initiatives such as positions within the mine and as well to assist in recruitment efforts at the high school level. The HR rep could coordinate with Alberta Works and the CVRI to develop a forum for the local school to promote the mining industry to the younger generation."	February 13, 2013	
23	Employment Opportunities for Students	Socio-economic development	increased employment for underemployed sector of Aboriginal society	Expressed interest in summer positions involving reclamation to help foster career paths for [Aboriginal Group] members	October 5, 2011	
			Discussed interest in summer student positions for [Aboriginal Group]	February 28, 2012		
			Chief and Council discussed interest in summer student positions.	May 4, 2012		
24	Employment Opportunities	Liaison	Liaison	[Individual] requested a continuing "liaison" with [Aboriginal Group], where someone chose from the community, who is knowledgeable of the Traditional Use (both past, current and anticipated future uses) in the area is available to, on a continuous basis, to be consulted on mine planning, development and operations. [Aboriginal Group] would then be able to ensure that Traditional Use and values are accounted for.	August 10, 2006	CVRI and Aboriginal Group D have entered into a long-term agreement that established a liaison position between the parties funded by CVRI. At this time there does not exist a reasonable justification for the establishment of a secretarial position or other supporting staff for the liaison position.
			Expressed that [Aboriginal Group] would be interested in a permanent liaison.	October 25, 2006		
			Stated that [Aboriginal Group] will want money for a liaison with the company	January 15, 2007		
			Chief stated that [Aboriginal Group] was interested in a full-time liaison and incorporated this into draft MOU	July 17, 2009		
			[Individual] requested funding for a secretary to help with his liaison position	March 1, 2012		
			[Individual] suggested to provide a proposal for a joint secretary to his liaison positions for CVRI and another company.	March 15, 2012		
25	Training Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	Stated that [Aboriginal Group] would be interested in money for training opportunities	January 15, 2007	CVRI has recently entertained a funding proposal brought to it from Aboriginal Group D that would see a third party assist Aboriginal Group D in providing training opportunities to its members. Senior management at CVRI are still considering the merits of supporting this program. CVRI and Sherritt are also working on the development of a corporate consultation strategy that may see the formalization of educational and training opportunities for Aboriginal persons. CVRI encourages members of the Aboriginal community to apply for jobs at the mine, both for trade and general labour positions, and has taken some steps to assist or accommodate Aboriginal circumstances in their employment. We do have some trades apprentice positions at the mine, and there is on the job training for equipment operators.
			Community Members asked if training for jobs was provided and what the qualifications were for the jobs	August 10, 2006		
			Expressed [Aboriginal Group] would be interested in training for employment opportunities	October 5, 2011		
			Environmental monitor expressed interest in TLU report stating in recommendations "Create job training for work in the area."	October 2011		
26	Education Support For Scholarships	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	An [Aboriginal Group] community member inquired if there was available scholarships or bursaries for people to go to school	August 10, 2006	CVRI and Sherritt are in the process of developing a corporate Aboriginal consultation plan. One of the items under a consideration is a scholarship or bursary program designed to help Aboriginal students fund continuing education. When and if such a program is developed, CVRI anticipates that Aboriginal Group D members would have access to it.
			Chief expressed interest in scholarships to be included in MOU	January 15, 2007		
			Expressed [Aboriginal Group] would be interested in scholarships for youth	October 5, 2011		
27	Education Support	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	Stated that [Aboriginal Group] will want money to support education	January 15, 2007	CVRI and Aboriginal Group D have entered into a long-term agreement that in part established funding for the community to use for the enhancement of educational or social initiatives. As always, CVRI entertains request for support funding on an ad hoc basis when such requests are presented. As part of the development of a corporate Aboriginal consultation plan, the formalization of such a funding program is one of the items under consideration.
			Expressed [Aboriginal Group] would be interested in funding for education	October 5, 2011		
			Chief stated that he would like to see money put towards education as part of community benefits from CVRI	October 12, 2011		
			Councillor stated that [Aboriginal Group] would like to see funding for educational opportunities	October 12, 2011		



D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
28	Contracting Opportunities	Socio-economic development	development of Aboriginal owned business; increased employment for underemployed sector of Aboriginal society	[Aboriginal Group] community members showed interest in contracting work particularly pertaining to tree planting	August 10, 2006	CVRI and Aboriginal Group D have entered into a long-term agreement written in part to address concerns regarding contracting opportunities for Aboriginal owned businesses at the mine brought up from the initiation of consultation activities in 2006. Working with their liaison from Aboriginal Group D, CVRI continues to make efforts aimed at providing contracting opportunities with this Aboriginal group associated with CVRI operations. Bearing in mind that CVRI is unionized and outside contracting opportunities are limited, some success has been met with in this regard, but opportunity for growth exists. Aboriginal Group D must also continue to pursue options with other industrial players in the region. Using existing resources and working under the agreement between the parties, CVRI expects to be able to make more positive impacts regarding Aboriginal Group D contracting opportunities in the future, which is one of the responsibilities of the liaison position with the mine. The current agreement contains provision for the inclusion of Aboriginal Group D "contracting capability" to participate in mining and reclamation activities. Such capability is yet to be available from Aboriginal Group D. The liaison is advocating the establishment of a "mining corporation" within Aboriginal Group D so as to participate more significantly in the business of mining. CVRI notes that Aboriginal Group D has recently added staff responsible for a long-range business strategy, but no such business entity has been established. CVRI notes that funding is available through the Ministry of Aboriginal Relations Aboriginal Economic Partnerships and First Nations Development Fund programs for the creation of such economic growth opportunities.
				Expressed that [Aboriginal Group] would like some guarantees for contracting opportunities	January 15, 2007	
				Chief asked about contracting opportunities for [Aboriginal Group]	July 8, 2009	
				Chief stated that [Aboriginal Group] was interested in contracting opportunities and incorporated this into draft MOU	July 17, 2009	
				Expressed interest in contracting opportunities for [Aboriginal Group]	April 26, 2011	
				Discussed contracting opportunities for [Aboriginal Group]	August 6, 2011	
				Expressed interest in a contracting opportunity for [Aboriginal Group]	October 5, 2011	
				Chief raised interest that [Aboriginal Group] should be afforded some of the work for contracting positions for the Robb Trend	October 12, 2011	
				Expressed that [Aboriginal Group] would like to see contracting opportunities for the Nation.	October 18, 2011	
				Chief expressed interest in contracting opportunities for [Aboriginal Group] involving environmental stating "protection of environment is crucial, we want to get involved in the monitoring and the work, not soul source but we want some of the work"	October 31, 2011	
				Discussed contracting opportunities for [Aboriginal Group]	28-Feb-12	
				Discussed contracting opportunities for [Aboriginal Group]	March 15, 2012	
Discussion of interest with Chief and Council	May 4, 2012					
29	Ceremonial Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	Request by Chief and Council for Pow Wow funding	May 4, 2012	CVRI and Aboriginal Group D have entered into a long-term agreement that in part established funding for the community to use for the enhancement of educational or social initiatives. As always, CVRI entertains requests for support funding on an ad hoc basis when such requests are presented. As part of the development of a corporate Aboriginal consultation plan, the formalization of such a funding program is one of the items under consideration.
30	General Community Infrastructure Support	Community Development	enhance Aboriginal social programs and services	Expressed that [Aboriginal Group] would be interested in financial support of social needs and for community contribution to economic development	January 15, 2007	CVRI and Aboriginal Group D have entered into a long-term agreement that in part established funding for the community to use for the enhancement of educational or social initiatives. As always, CVRI entertains requests for support funding on an ad hoc basis when such requests are presented. As part of the development of a corporate Aboriginal consultation plan, the formalization of such a funding program is one of the items under consideration.
				Stated [Aboriginal Group] looking for funding for multi-plex recreation centre	October 5, 2011	
				Chief stated "need to heighten community engagement, other companies do community benefits...we are trying to build a multi-purpose facility, government does not help..want you to consider funding us on that somehow"	October 31, 2011	
				Expressed that [Aboriginal Group] would like to establish an MOU with CVRI	October 25, 2006	
				Chief stated that MOU will need to look at liaison, scholarships, monitoring and employment opportunities	January 15, 2007	
				[Legal counsel] sent a letter on behalf of [Aboriginal Group] addressing that they would like to work on an MOU with Coal Valley to address [Aboriginal Group] concerns with the project.	July 17, 2008	
				Chief stated "if we're seriously talking of moving ahead, categorically I want an agreement, if it's 25 years, have to consult with my community, need series of meetings in next few months."	July 8, 2009	

D	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation or Response
31	Long-Term Agreement	MOU	MOU	Chief discussed MOU agreement with incorporation of full-time liaison and contracting	July 17, 2009	<p>CVRI has been consulting with Aboriginal Group D on the Robb Trend Project since 2006, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. CVRI has responded to these concerns regarding a long-term agreement between the parties. One of the purposes of discussions with individual Aboriginal groups regarding community benefit agreements is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, but that those restrictions will not be permanent and can be mitigated through other opportunities, economic or otherwise, associated directly with the Project mining and reclamation activities, or in other areas such as educational programming. CVRI and Aboriginal Group D have entered into such a long-term agreement, including the Robb Trend Project area, as a result of previous and on-going consultation. This agreement provides mitigations or opportunities associated with on-going mining negotiated to specifically address future Project impacts and provide development opportunities to Aboriginal Group D. As noted in some of the concerns mentioned, CVRI believes that this agreement provides one mechanism through which Aboriginal Group D can improve the financial situation of the Aboriginal group as a whole and individual members. The success of this agreement in helping to attain such goals can only be adequately judged in the long-term, but CVRI has lived up to its commitments as outlined in the agreement and detailed in some of the other responses above. The liaison is advocating the establishment of a "mining corporation" within Aboriginal Group D so as to participate more significantly in the business of mining. CVRI notes that Aboriginal Group D has recently added staff responsible for a long-range business strategy, but no such business entity has been established. CVRI notes that funding is available through the Ministry of Aboriginal Relations Aboriginal Economic Partnerships and First Nations Development Fund programs for the creation of such economic growth opportunities.</p>
				Expressed Chief and Council would be interested in agreement focused on jobs, training, scholarships, community centre funding.	October 5, 2011	
				Listed under issue "[Aboriginal Group] is agreeing to this development but is dependent on the negotiated deliverables that will be provided by the proponent. In the impact benefits agreement. Clearly, the [Aboriginal Group] will seek out concise measures to enhance the sustainability of socio-economics through a comprehensive environmental monitoring strategy that will take into account traditional values in an effort to quantify the loss of access to the traditional livelihood that is recognized and affirmed in the Canadian Constitution under sec35." and, under what [Aboriginal Group] wants "The [Aboriginal Group] can procure a lifetime of income that will aid in contributing to GDP. Partnerships and joint venture initiatives can be established that will expand economic opportunities for the [Aboriginal Group]. The development of a mining corporation that is able to procure a diversity of contracting opportunities can potentially grow the entrepreneurial spirit that is common in mainstream. Begin to offset the dependency of the socialism and the programming that has hindered the economic growth of the community and its residents."	February 13, 2013	
				Listed under issue "The current agreement between CVRI and [Aboriginal Group] is one small step above an MOU. It is not acting like an IBA but they intend to negotiate an actual IBA." and under what [Aboriginal Group] wants "The current agreement was a milestone. Through on-going discussions the [Aboriginal Group] is attempting to develop a full fledge IBA in order to plan for future developments relative to enhancing the sustainability of socio-economics for the community and the residents."	February 13, 2013	

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	Hunting	direct impact/removal of hunting, gathering locations in Project area	<p>The March 13, 2012 traditional use report provides UTM coordinates for 23 recorded locations in the [Aboriginal Group] Traditional Land Use database. These are characterized either as salt/mineral licks (presumably important for game and hunting locations), or culturally sensitive areas which can include hunting areas, medicinal plant locations, rivers, water tables, wetlands, beaver dams, or creeks. Plotting these sites shows 6 salt/mineral licks within the Robb Trend Project area, and another 4 on the boundary. 1 culturally sensitive site of unknown type is within the Robb Trend Project area (may be where moose observed). The report indicates that "Any potential impact on these sites will require further negotiation/and/or compensation for the loss of traditional land use by the [Aboriginal Group] First Nation membership."</p> <p>Community must go elsewhere to hunt and gather medicine.</p> <p>"[Aboriginal Group]'s hunters, gatherers and elders utilize these areas for hunting and gathering herbs and medicines."</p> <p>If the salt-licks are destroyed, the animals will migrate. It affects our right to hunt and fish.</p> <p>35 of us per year depend on a salt lick, our way of life is shot, we need something in writing, something we can benefit from the destruction.</p>	<p>March 13, 2012</p> <p>October 25, 2012</p> <p>March 8, 2012; March 13, 2012</p> <p>April 21, 2009</p> <p>October 25, 2012</p>	<p>No Aboriginal group consulted to date has demonstrated that access restrictions to the Project area will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake the Rights to hunt, fish, and trap for food on Crown lands as protected under Treaty or undertake other traditional pursuits. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights and traditional uses during the development of the Project. The purpose of discussions with individual Aboriginal groups is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, and that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, and that further consultation may result in the identification of mitigations or accommodations of potential impacts suitable to all parties. As noted in the concerns, Aboriginal Group E indicated that further negotiation will be required in their opinion for the loss of access to these lands for hunting and any impact to the locations identified in their reporting. Although CVRI will offer neither Aboriginal Group E nor any other Aboriginal group "compensation" for the loss of land available to exercise Treaty hunting rights, it has been and is currently in the process of discussing a possible community benefit agreement that will in part mitigate Aboriginal Group E concerns through other opportunities, economic or otherwise, associated directly with the mining and reclamation activities, or in other areas such as educational programming.</p>
				<p>Were there native ponds up there before the mining, and have fish now congregated in the lakes? But are there native fish, did you test them before and after?</p>	<p>April 21, 2009</p>	<p>No native ponds will be affected due to the development of the Project. End pit lakes are one of the end results of coal mining and two stocked lakes currently exist within the CVM permit boundary. Silkstone and Lovett Lake are reclaimed end pits and are stocked by ESRD on an annual basis. Silkstone and Lovett Lakes are stocked with rainbow trout by AESRD. CVRI does not have information on the edibility of the stocked fish. However, CVRI has studied the water quality of its end-pit lakes. There have now been three sets of limnological and ecological studies conducted on CVM end-pit lakes: the studies in the 1990s conducted on Lovett, Silkstone, and Stirling (Pit 24) lakes (Agbeti 1998, Mackay 1999); the 2006 studies conducted on Lovett, Silkstone, and Stirling (Pit 24) lakes plus Pit 35 and Pit 45 lakes (Hatfield 2008), and the current study. Taken together, the results of these studies indicate that there may be fewer constraints of water quality to the ecological viability of end-pit lakes in the CVM area than those described in End-Pit Lake Working Group (2004):</p> <ol style="list-style-type: none"> <li>1. The concentration of a number of water quality variables, such as nutrients and major ions, are higher in end-pit lakes than in natural lakes, but these higher concentrations are not at levels that would affect the ecological viability of the end-pit lakes.</li> <li>2. There have been relatively few instances of measured water quality variables, including metals, exceeding provincial or federal water quality guidelines.</li> <li>3. The incidence of water quality guideline exceedance is not measurably greater in end-pit lakes than in natural lakes in the CVM area.</li> <li>4. The trophic status of end-pit lakes is similar to that of natural lakes in the CVM area.</li> </ol> <p>The exception to this is dissolved oxygen. The results of this study indicate there are portions of end-pit lakes in all seasons sampled with concentrations of dissolved oxygen that are below provincial guidelines for the protection of aquatic life. The same is true of Fairfax Lake, the natural lake that was surveyed as part of this study. The depth patterns of dissolved oxygen in the lakes that were studied are related to processes of lake stratification and turnover.</p> <p>CVRI can also offer the following information with respect to edibility of fish in the region. The predicted exposure to methyl mercury is associated with Risk Quotient (RQ) values greater than 1.0 for the resident group in the multiple pathway assessment. The maximum RQ value of 1.3 for the resident group is not predicted to change from the Baseline Case to Application Case. The Project is not expected to measurably increase methyl mercury-related health risks in the region. Methyl mercury is the form of mercury that is of greatest concern with respect to accumulation in biological organisms, and subsequent consumption by people (Health Canada 2007). Food intake is the primary route of exposure to mercury compounds in humans, with fish and seafood being the most significant contributors to human exposure (ATSDR 1999). For the resident group, the highest RQ value was predicted for the toddler life stage, where 100% of the estimated daily intake of methyl mercury is attributable to local fish consumption. The methyl mercury concentration (i.e., 95UCLM) in fish used in the HHRA is 0.11 mg/kg wet weight. This concentration is below the subsistence fish consumption guideline of 0.2 mg/kg recommended by Health Canada (2007). The fish consumption rates used in the HHRA represent rates cited by Health Canada (2007) for subsistence fish consumers for all types of fish. No adjustments for local fish consumption preferences were applied, suggesting that the consumption rates used may be conservative. At present, there is no consumption advisory on fish caught from the Embarras or McLeod River within the RSA for the Project (Government of Alberta 2011). Additional factors that may have contributed to the overestimation of the health risks are:</p> <ul style="list-style-type: none"> <li>• the estimated daily intakes and associated RQ values are based on the assumption that people rely on locally caught fish as a part of their diet;</li> <li>• the exposure limit used in this assessment (0.1 µg/kg/day) is based on developmental impairment in children. Health Canada (2007) cites a TDI of 0.2 µg/kg/day for methyl mercury. When compared to the Health Canada TDI, the RQ values for the resident toddler is reduced to 0.7;</li> <li>• it is important to note that any nutritional benefits associated with eating fish from the RSA were not accounted for in the characterization of the potential health risks; and</li> <li>• the predicted RQ values for methyl mercury remain consistent across the Baseline and Application Case for the resident group. This suggests that the Project is not expected to increase methyl mercury-related health risks in the region.</li> </ul>

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
2	Potential Impact to Treaty or Aboriginal Rights	Fishing	removal of fish resources/habitat in Project area	"There are also fish-bearing creeks and natural waterways that [Aboriginal Group] does not want disturbed or destroyed. The McLeod River, Mercoal Creek, Embarras River, Chance Creek (only to name a few) are natural rivers and streams that come from the glacial mountains and are the last of the earth's fresh water supply, within the Foothills region...Is there a guarantee that these natural waterways will not be permanently damaged?"	March 8, 2012; March 13, 2012	<p>Watercourses will be affected due to the development of the Project. Watercourses that require to be diverted will be reclaimed to similar conditions prior to disturbance. No identified and established watercourse will be "completely destroyed". Potential changes in surface water quality in the RSA were assessed as insignificant (Section E.11, CR# 11) and are not expected to significantly impact fish populations in the RSA. No additional access to water bodies in the RSA is expected to occur as a result of the Project. CVRI will monitor watercourses within the watersheds to be affected by the Project. Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including:</p> <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval.</li> </ul> <p>The surface hydrology assessment presents proposed water management plans and addresses the potential impact of the Project on:</p> <ul style="list-style-type: none"> <li>• the quantity of surface water flow and stream behaviour during high, average and low flow conditions; and</li> <li>• sediment concentrations in local and regional streams.</li> </ul> <p>Various water management and sediment control measures will be implemented for the Project during operations, reclamation, and closure, including:</p> <p>1) Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval; 2) Release of water pollutants from the site such as oil and grease is controlled. With the installation of oil booms on the impoundments and immediate containment of oil in the event of a spill, there is little danger of these materials contaminating surface waters. Components of the water handling system will be designed according to the governmental specification and the systems will be operated in accordance with regulatory approval requirements; and Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval; 3) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; and 4) All mine-affected water will be treated prior to its release in to the receiving waters to reduce potential effects from loading of suspended sediments and potential effects of water quality variables typically associated with suspended sediments (e.g., total aluminum and total iron). [continued below]</p>
				continued from above		<p>[continued from above] CVRI will pay particular attention to selenium (see below). The mine wastewater treatment program similar to the one currently in use at the CVM will be established to minimize downstream siltation and minimize downstream effects on surface water quality; 5) With respect to selenium, the CVM will continue an effective water quality monitoring program including a focus on selenium concentrations. The objective will be to observe water quality relative to baseline values to identify any changes over time. Should a significant increase in selenium levels be noted an investigation will be undertaken to identify possible sources and mitigation plans will be implemented; 6) Where necessary, interim erosion/sediment control measures will be utilized until long-term protection can be effectively implemented; 7) Minimization of the time interval between clearing/grubbing and subsequent earthworks, particularly at or in the vicinity of watercourses or in areas susceptible to erosion; 8) Slope grading and stabilization techniques will be adopted. Slopes will be contoured to produce moderate slope angles to reduce erosion risk. Other stabilization techniques used to control erosion include: ditching above the cutslope to channel surface runoff away from the cutslope, leaving buffer (vegetation) strips between the construction site and a watercourse, placing large rock rip rap to stabilize slopes; 9) Whenever possible, construction activities in close proximity to watercourses will be carried out during periods of relatively low surface runoff in late fall, winter and early spring (from October to April). A 30 m buffer (vegetation) strip will be left between construction sites and watercourses except at stream crossings and diversions; 10) Temporary measures to control erosion before a vegetation cover is reestablished, including: diversion ditches, drainage control, check dams, sediment ponds, sumps and mulches; 11) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; 12) The design and construction of all stream crossings will be done in compliance with the Alberta Code of Practice for Watercourse Crossings and associated guidelines. This means that all stream crossings constructed by the Project will meet regulatory requirements for protection of fish resources and aquatic habitat; this will also effectively mitigate against effects on surface water quality.</p> <p>Mining activities are expected to reduce high flows, and low flows are expected to either remain the same, slightly decrease or slightly increase. Annual runoff may have modest variations dependent on mining activities at the time (e.g. pit dewatering). Temporary water diversions will also contribute to some slight variations in flow quantity for short periods of time. Instream flows will be maintained by bypass pumping. Depending on the extent of the disturbance footprint within the watershed the significance to flow quantity may remain the same, increase or decrease depending on the mine progression and seasonal variability. Dewatering of the groundwater around or in the mine pits, to permit mining, increases surface flows. This is usually a minor flow component of the overall surface runoff rate from an area. The magnitude of the flows is small and regulated by pumps. If the sump or dewatering area is well laid out and separated from active mining, the effect on sediment loads can be negligible. Impoundments such as settling ponds or end pit ponds or lakes generally reduce downstream peak flows as a result of storage. Increases in low flows can result from a more gradual release of the water stored in the impoundment. Depending upon their size, pond evaporation losses may be significant at times but is near balanced with direct precipitation on an annual basis. Depending upon their size and efficiency, impoundments can reduce sediment loads significantly. End pit ponds will reduce flows when initially filling but can provide opportunities for enhancement. For open water bodies (lakes, ponds and to some extent wetlands), lake evaporation essentially replaces evapotranspiration in equation (1) above with groundwater having both an inflow and outflow component. After initial filling and stabilization of the groundwater level, such that the net regional groundwater recharge is the same as pre-mining, it may be assumed that groundwater inflow equals outflow on an average annual basis. It should be noted that even large differences in net groundwater inflow/outflow for the water bodies typically will have minor net surface flow impacts because of the small areas of the ponds relative to the basin sizes and the smaller groundwater flow component compared to the surface runoff component. Diversions will be sized and designed to convey peak flows safely considering the life of the diversion. As a result, water diversions do not impound water or cause losses due to infiltration (if lined) and, if returned to the same stream, will not affect the magnitude of downstream flows. All defined watercourse crossings will be designed, and constructed, to meet or exceed the regulatory requirements for approval under the provincial Water Act and the federal Fisheries Act and Navigable Waters Protection Act. If appropriately designed and constructed, these crossings will have negligible effect on flows or sediment loads to the streams.</p>

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
3	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of medicinal plant gathering locations in Project area	"[Aboriginal Group]'s hunters, gatherers and elders utilize these areas for hunting and gathering herbs and medicines."	March 8, 2012; March 13, 2012	<p>CVRI acknowledges that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses, including medicinal plant gathering, for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional pursuits will not be restricted in the entire area upon Project approval nor will it be permanent, as it will mine the Robb Trend in stages over a 25-year period as discussed above. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. The purpose of discussions with individual Aboriginal groups is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, and that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, and that further consultation may result in the identification of mitigations or accommodations of potential impacts suitable to all parties. CVRI has been and is currently in the process of discussing a possible community benefit agreement that will in part mitigate Aboriginal Group E concerns through other opportunities, economic or otherwise, associated directly with the mining and reclamation activities, or in other areas such as educational programming.</p> <p>CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecosite phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecosite phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecosite phases which support TEK vegetation will be accessible in the RSA following removal of ecosite phases by the Project Footprint in the LSA. It is assumed that ecosite phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:</p> <ul style="list-style-type: none"> <li>• inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application;</li> <li>• working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and,</li> <li>• implementing a re-vegetation program which aims at the re-establishment of ecosites common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecosites will, over time, again support TEK vegetation.</li> </ul> <p>With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecosite phases within the LSA. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established.</p>
4	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of burials in Project area	<p>We want to have a meaningful consultation before the disturbance, we don't want burials run over, removed etc., as has been happening in industry.</p> <p>The March 13, 2012 traditional use report does not indicate the presence of burials within the Robb Trend, but notes burials in Twp 47 Rge 19, Twp 47 Rge20, Twp 46 Rge 19, Twp 46 Rge 20 that should be protected. A portion of the Project passes through the northeast corner of Twp 47 Rge 19. Based on previous discussions with [Individual] requesting access to Coal Valley, the Twp 47 Rge 19 burials are likely in the vicinity of Lovetteville.</p>	<p>April 21, 2009</p> <p>March 8, 2012; March 13, 2012</p>	<p>Maps produced during past meetings showed salt licks and moose in the Robb Trend Project area, but no burials in conflict with this or any other proposed CVRI development. To date no Aboriginal group has notified CVRI of the location of a burial within the Robb Trend Project area. Some Aboriginal burials and non-Aboriginal burials in the general area are known to CVRI, the locations of which are privy to those who have identified their locations, and which may include those listed in the legal to the right. CVRI has previously modified its proposed Robb Trend permit area removing some known burials from the Project lands, none of which are associated with Aboriginal Group E. CVRI is fully prepared to work with Aboriginal communities to avoid burials identified or undertake other mitigative options. If during operations possible burials are encountered in the Project area, CVRI is prepared to work with Aboriginal communities and regulators to confirm burial association and devise an appropriate avoidance or mitigation strategy. The presence of human remains or burials on Project lands, whether Aboriginal or not, is subject to Federal and Provincial laws and regulations including Section 182 of the Criminal Code, the Alberta Cemeteries Act, and potentially the Alberta Historical Resources Act. Knowingly disturbing human remains (improper interference) without legal authorization constitutes a criminal act, and knowingly disturbing burials, recorded or not, without legal authorization contravenes the Cemeteries Act and potentially the Historical Resources Act. In addition to moral duties, sanctions of both a criminal and financial nature for any actions provide significant impetus for CVRI to act swiftly and accordingly should potential burials be identified during development activities. Mine management will ensure that all supervisors and workers are aware of the legal and moral issues regarding possible burials.</p>
5	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	impacts to general traditional use area	<p>[Aboriginal Group] has a traditional interest in the area where the mine expansion is proposed to occur. There is concern with the development and the potential impacts on traditional use and the consultation process must be done properly. Specific concerns in the area include known grave sites in the area, animal salt lick location, medicinal herbs along with a range of environmental needs and concerns</p> <p>[Aboriginal Group] has significant sites directed within this area.</p>	<p>October 2, 2006</p> <p>November 15, 2012</p>	<p>CVRI has been engaged in consultation with Aboriginal Group E on its proposed projects, including the Robb Trend, since 2006, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. CVRI acknowledges that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. No Aboriginal Group E burials within the Project area have been reported to CVRI as noted above. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional pursuits will not be restricted in the entire area upon Project approval nor will it be permanent, as it will mine the Robb Trend in stages over a 25-year period as discussed above. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. The purpose of discussions with individual Aboriginal groups is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, and that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, and that further consultation may result in the identification of mitigations or accommodations of potential impacts suitable to all parties. As noted in the concerns, Aboriginal Group E indicated that further negotiation will be required in their opinion for the loss of access to these lands for hunting and any impact to the locations identified in their reporting. Although CVRI will offer neither Aboriginal Group E nor any other Aboriginal group "compensation" for the loss of land available to exercise Treaty hunting rights, it has been and is currently in the process of discussing a possible community benefit agreement that will in part mitigate Aboriginal Group E concerns through other opportunities, economic or otherwise, associated directly with the mining and reclamation activities, or in other areas such as educational programming.</p>
6	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to water quality in Project area	<p>The other major concern to the elders is the destruction of natural streams. We are getting into an era with not enough water. Is it possible not to disturb the water?</p> <p>"There are also fish-bearing creeks and natural waterways that [Aboriginal Group] does not want disturbed or destroyed. The McLeod River, Mercoal Creek, Embarras River, Chance Creek (only to name a few) are natural rivers and streams that come from the glacial mountains and are the last of the earth's fresh water supply, within the Foothills region...Is there a guarantee that these natural waterways will not be permanently damaged?"</p>	<p>April 21, 2009</p> <p>March 8, 2012; March 13, 2012</p>	<p>See response #2 above. None of the watercourse named will be directly impacted by the Project as they are located outside of the Project area. The mitigation measures described in response #2 will serve to protect these downstream waters.</p>

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
7	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general effects on wildlife in Project area	"Wildlife animal habitats, burrowing areas and natural migratory routes. These routes have been in existence since before any disturbance came upon the lands."	March 8, 2012; March 13, 2012	<p>Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Tasks that were completed during the wildlife assessment include:</p> <ul style="list-style-type: none"> <li>• identify relative abundance, concentration areas, distribution patterns, and habitat associations of ungulates by means of winter aerial surveys, snow track-counts, and a spring pellet-browse survey;</li> <li>• identify small mammal, avian and amphibian presence, relative abundance and habitat association by means of snow track-counts, trapping small mammals, owl surveys, spring bird survey, breeding bird survey, migration survey, and amphibian survey;</li> <li>• compile a list of vertebrate species (excluding fishes) and identify their status as per the Committee on Endangered Wildlife in Canada (COSEWIC), the Canadian Endangered Species Conservation Council (CESCC 2006) and the General Status of Alberta Wild Species (ASRD 2005);</li> <li>• prepare a habitat map to identify the quantity and quality of habitat present in the Project Development Areas;</li> <li>• update wildlife use of the existing CVM by means of aerial survey, systematic monthly ground surveys, spring pellet-group counts, breeding bird survey and amphibian survey;</li> <li>• identify Valued Environmental Components for assessing the potential impact of the proposed development on ungulates, small mammals, birds and amphibians;</li> <li>• discuss biodiversity at the LSA and RSA scale;</li> <li>• review Traditional Use Studies (TUS) prepared for CVRI from a wildlife perspective;</li> <li>• discuss climate change with respect to changes in the Boreal-Cordilleran ecoregion that may affect wildlife; and</li> <li>• evaluate the potential impacts of the Project within a temporal and spatial perspective that incorporates existing and future demands by other users and developments by conducting a quantitative cumulative effects assessment for elk.</li> </ul> <p>In order to reduce potential impacts to wildlife within the Project area, the following mitigation measures will take place:</p> <ul style="list-style-type: none"> <li>• incorporate select native trees and shrubs such as alder and willow into re-vegetation activities;</li> <li>• maximize downed woody debris (stumps) through direct placement of top-soil and associated slash and stumps;</li> <li>• maintain and connect to core areas as many residual forest patches as possible;</li> <li>• maintain a 30 metre buffer zone of undisturbed natural habitat along well developed riparian corridors, where available;</li> <li>• plant coniferous trees at higher stem densities (&gt;180 stems per acre);</li> <li>• continue to maintain hunting and firearm restrictions on the reclaimed areas of the Project including after mining has ceased and until hiding cover on the mines is equivalent to that of natural closed forest cover types.; and</li> <li>• maintain haul truck and regular vehicle speeds of &lt;70 kph.</li> </ul> <p>In order to evaluate and if need be adapt the mitigation measures, CVRI will also implement monitoring. Site wide monitoring will allow CVRI to determine the length of time it takes for wildlife to return to the landscape and what reclaimed landscape features are most desirable. All potential effects are noted to be reversible over the short-term or long-term depending on the type of effect.</p> <p>Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features.</p>
8	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to environmental quality in Project area	I think the major question would be the pollution.	April 21, 2009	<p>CVRI's goal is to foster the safe, orderly and efficient development of its coal resources. This is done in a manner to achieve and maintain a balance between meeting the needs of its customers and protecting the environment. As part of conducting its mining operations in a safe and efficient manner, the company strongly endorses initiatives which protect and enhance environmental quality. These initiatives illustrate the company's proactive commitment towards carrying out mining operations in an environmentally responsible manner. CVRI will adopt the same environmental and operating practices championed at the existing mine to the Project area.</p> <p>CVRI has many Standard Practices and Procedures and specifically practices aimed at preventing pollution including:</p> <ul style="list-style-type: none"> <li>• reuse and recycling of products;</li> <li>• substitution of products purchased with more "environmentally friendly" materials;</li> <li>• equipment modifications and improved operating efficiencies; and</li> <li>• conservation of materials and resources.</li> </ul> <p>CVRI is an active participant in many environmental and regulatory initiatives and will continue to be an active member of these programs during the operating life of the Project. Programs range from participation in regional programs such as the West Central Airshed Society (WCAS) and West Fraser's Forest Resources Advisory Group (FRAG), to provincial and national initiatives. CVRI is committed to ensuring that its operations comply with all relevant laws and regulations.</p> <p>CVRI also has an Environmental Protection Program at the CVM which is designed to first prevent and second to minimize adverse environmental impacts resulting from mine related operations. The program will be implemented in the Project area through the following on-site mechanisms:</p> <ul style="list-style-type: none"> <li>• adaptive management approach to environmental risk assessment;</li> <li>• Safety, Health and Environment Committee (SHE) comprised of key CVRI employees;</li> <li>• emergency response and wildfire control and prevention;</li> <li>• waste management program;</li> <li>• spill response and clean up procedures;</li> <li>• operating policy commitments; and</li> <li>• site reclamation.</li> </ul>
9	Potential Impact to Treaty or Aboriginal Rights	Health	general impacts to animal health quality in surrounding region	How about big game, there is a big elk herd up there, some must have lived for years, have any of those been tested? I was mentioning to Dan if we could harvest an elk, have it tested, you could test it too.	April 21, 2009	<p>An examination of elk observations during Fish and Wildlife moose surveys in the area on the north side of the existing CEA study area indicates scattered elk in low numbers. There is not a substantive elk population in this area. The large herds referred to are likely those that make use of the currently reclaimed areas at the CVM mine. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. It is expected that elk and deer will respond positively to the early stages of upland reclaimed and re-vegetated areas on the LSA particularly in the Robb West, Main and Central zones where there is extensive mixed wood and deciduous habitat adjacent the disturbance area. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback.</p> <p>CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features. CVRI also aims to maintain as much undisturbed habitat as possible during mining will help to enhance the wildlife diversity of the reclaimed sites.</p> <p>Wildlife monitoring including aerial surveys, winter track surveys, pellet count surveys and the use of wildlife cameras have all been completed and continue to occur at the CVM. No animals have been harvested for further analysis.</p>
10	Potential Impact to Treaty or Aboriginal Rights	Hunting	loss of access to additional land for hunting in general region	[Aboriginal Group] is losing hunting and gathering rights to this particular Traditional Territory.	November 15, 2012	<p>See response #1 above and #11 below. Not all of the Project area will be disturbed at one time. CVRI can work with local First Nation groups to identify periods of time in certain locations (undisturbed by mining and safe to access) in which berry picking and medicinal plant gathering can occur. Hunting within the mine permit boundary cannot occur as carrying firearms within the permit boundary is restricted for safety reasons.</p> <p>CVRI's reclamation objective for the CVM is to reclaim mined lands to meet equivalent land capability with the intended end land uses. The achievement of this objective assures that mining is a temporary use of the land. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations.</p>

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
11	Potential Impact to Treaty or Aboriginal Right	Hunting	loss of access to land available for hunting in Treaty 6 area	Our fishing and hunting rights have been negatively impacted, things such as grazers, bear dens, herbs, and medicines. Ceremonial sites have been destroyed, we still utilize them. We think you will have respect if you know where the sites are. Industry has been having a cumulative adverse impact, all of it affects together, we need to minimize and mitigate that.	April 21, 2009	The overall cumulative effects of Crown taking up of land for other purposes as allowed under Treaty is an issue that is beyond the scope of the present consultation. Aboriginal Group E leadership needs to engage the Provincial and Federal Crowns in this regard. However, CVRI is of the opinion that the Robb Trend Project will not represent an onerous loss of land base in the region available for the exercise of Treaty Rights to hunt, fish, and trap for food or undertake other traditional uses of the land. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights and traditional uses during the development of the Project. Aboriginal Group E has reported no ceremonial site locations in the Project area to CVRI, thus impacts to those specifically are not an issue with the development.
12	Consultation Process	Consultation Process	Consultation Process	[Aboriginal Group] does not subscribe to and is not part of the Alberta Government's consultation policy and guidelines approach to First Nation consultation	October 2, 2006	CVRI understands that Aboriginal Group E along with the other Treaty 6 Chiefs have rejected the Province's consultation policies and guidelines. These policies and guidelines were developed in response to applicable jurisprudence, notably several important Supreme Court of Canada decisions, and follow the Court's guidelines resulting from those decisions. While seeking regulatory approvals, CVRI must in fact follow the Government of Alberta expectations for consultation as outlined in those guidelines. The Crown is ultimately responsible for consultation given that the Duty to Consult is vested in the Honour of the Crown, not CVRI to whom only aspects of the consultation process have been delegated. Therefore, discussion of the process of consultation and concerns with it is an issue that needs to be raised with the Crown. One of the purposes for the inclusion of concerns such as this into this record is to help communicate on-going concerns with the consultation process to the Crown.
13	Compensation	Compensation	-	There are a number of things to negotiate: compensation, participation...They are looking for accommodation for the development within their area. From the business aspect this is: compensation, equity share, reclamation opportunities...But we need to raise it to a settlement negotiation, something to deal with the outstanding claim.	April 21, 2009	CVRI acknowledges that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. This has in fact resulted in the low threshold triggering a Duty to Consult. CVRI does recognize that the development of the Project can offer mutually beneficial opportunities in the forms of employment and contracting opportunities to potentially affected Aboriginal groups, and that CVRI can help provide community support to Aboriginal groups from time to time as a good "corporate citizen." It will continue to discuss ways in which Aboriginal Group E can potentially benefit from the development of natural resources in the region, but CVRI will not be offering compensation in the forms of payments or royalties to any Aboriginal group. Should Aboriginal Group E believe it is entitled to compensation in the form of lease or royalty fees, the Provincial and Federal Crowns should be contacted to discuss this issue. CVRI is more than willing to continue discussions with Aboriginal Group E on an MOU with reasonable terms that offers mutual benefit to both parties.
				Discussion of a type of compensation plan prior to "signing off" on project.	March 22, 2012	
				Discussion of a type of compensation plan prior to "signing off" on project.	October 25, 2012	
				CVR stands to make billions of dollars for 25-30 years and this is not sufficient compensation for the infringement of our Treaty Rights, under sec. 35 of the Canadian Constitution.	November 15, 2012	
14	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	Commitment from Coal Valley to make sure people are involved in employment	January 13, 2012	CVRI has been engaged in discussions with Aboriginal Group E regarding employment opportunities for its membership for a considerable time. Discussions regarding an agreement between the parties are not complete, thus any specific terms in this regard have not been agreed to. CVRI encourages members of the Aboriginal community to apply for jobs at the mine, both for trade and general labour positions, and has taken some steps to assist or accommodate Aboriginal circumstances in their employment. Coal Valley is a union shop, and CVRI will neither implement a general Aboriginal employment "quota" nor one directed specifically at Aboriginal Group E or any other potentially affected Aboriginal group.
15	Training Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	Discussion in-house training opportunities, heavy duty mechanics, millwrights, apprenticeships, scholarships.	October 25, 2012	CVRI has been engaged in discussions with Aboriginal Group E regarding training opportunities for its membership. Discussions regarding an agreement between the parties are not complete, thus any specific terms in this regard have not been agreed to. CVRI encourages members of the Aboriginal community to apply for jobs at the mine, both for trade and general labour positions, and has taken some steps to assist or accommodate Aboriginal circumstances in their employment. We do have some trades apprentice positions at the mine. There is on the job training for equipment operators. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program for educational/training opportunities is one of the items under consideration. When and if such a program is developed, CVRI anticipates that Aboriginal Group E would have access to it.
				Low employment rate and need for training	October 25, 2012	
16	Education Support	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	[Individual] said that CVM should not be surprised if a request is made to provide a donation in support of either or both of the local suicide prevention program or the cyber school initiative involving 30 First Nation communities.	October 2, 2006	CVRI has been engaged in discussions with Aboriginal Group E regarding scholarship opportunities for its membership. Discussions regarding an agreement between the parties are not complete, thus any specific terms in this regard have not been agreed to. CVRI and Sherritt are in the process of developing a corporate Aboriginal consultation plan. One of the items under a consideration is a scholarship or bursary program designed to help Aboriginal students fund continuing education. CVRI will continue to consider funding Aboriginal Group E community programs such as those noted through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration.
				Request scholarship programs for post-secondary studies.	January 13, 2012	
				Request scholarship programs for post-secondary studies.	October 25, 2012	
				Discussion of scholarship programs for post-secondary studies.	March 22, 2012	
				Request for funding annual funding for community related events, pow wows, Christmas hampers.	October 25, 2012	
				Request for funding annual funding for community related events (sports activities, pow wows, Christmas hampers etc.).	December 5, 2012	
17	Contracting Opportunities	Socio-economic development	development of Aboriginal owned business; increased employment for underemployed sector of Aboriginal society	[Aboriginal Group] has a Development Corporation that owns a construction company that does lease development and heavy construction work; some of the revenues are used to raise money for unfunded programs	October 2, 2006	CVRI has been engaged with Aboriginal Group E for several years and has discussed this concern with contracting opportunities at the mine for Aboriginal owned businesses. Discussions regarding a final agreement between the parties are on-going, thus any specific terms in this regard have not been settled nor otherwise agreed to. CVRI would be happy to work with those businesses to provide opportunity for their growth if available, bearing in mind that CVRI is unionized and outside contracting opportunities are limited. Opportunity for growth exists and will be investigated. Aboriginal Group E must continue to pursue options with other industrial players in the region. Using existing resources and working under an agreement between the parties if reached, CVRI expects to be able to make more positive impacts regarding Aboriginal Group E contracting opportunities in the future.
18	Ceremonial Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	Request for pow-wow donation.	January 13, 2012	CVRI will continue to consider funding Aboriginal Group E community programs such as this through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration. When and if such as program is developed, CVRI anticipates that Aboriginal Group E would have access to it.
19	General Community Infrastructure Support	Community Development	enhance Aboriginal social programs and services	Request for contribution towards new multi-cultural centre.	October 25, 2012	As part of its continuing efforts to reach a written agreement with Aboriginal Group E, CVRI has discussed the issue of providing funding towards a feasibility study for a new multi-cultural centre. Discussions regarding a final agreement between the parties are on-going, thus any specific terms in this regard have not been settled nor otherwise agreed to.
				Request for contribution towards new multi-cultural centre.	March 22, 2012	
				Request for funding for feasibility study for new community centre.	December 5, 2012	

E	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Dates Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
20	General Community Support	Impact Benefits Agreement	enhance Aboriginal social programs and services	What can Coal Valley do for me? Not just trinkets, something long-term that we can look back on and they tell me "thank you."	October 25, 2012	CVRI recognizes that the development of the Project can offer mutually beneficial opportunities in the forms of employment and contracting opportunities or educational benefits to potentially affected Aboriginal groups, and that CVRI can help provide community support to Aboriginal groups from time to time as a good "corporate citizen." It will continue to discuss ways in which Aboriginal Group E can potentially benefit from the development of natural resources in the region. CVRI is more than willing to continue discussions with Aboriginal Group E on an MOU with reasonable terms that offers mutual benefit to both parties.



F	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	general impact to Treaty rights	general impact to Treaty rights	<p>IT is my understanding that Coal Valley Resources will be required to undertake meaningful consultation as the proposed reopening of the Robb Trend Coal mine runs in our Ancestral Land Use Areas. I realize there are many first nations who utilize this area and have identified land uses. [Aboriginal Group] is no exception we have nation members who still utilize this area for hunting, fishing and gathering...I am pleased to read this as they [other Aboriginal Group] are the ones who will experience the most impact we have nation members here on [Aboriginal Group] who also utilise the area, I look forward in hearing from you in the near future.</p> <p>[Aboriginal Group] submits that [Aboriginal Group] affidavits and conclusions of EIA for Project demonstrate "some degree of location or connection between the work proposed by CVRI and the Aboriginal, Treaty, and NRTA rights of [Aboriginal Group] members to hunt, fish, gather and trap in the areas within the footprint and immediately surrounding area of the Project and the Local Study area, as well as other areas of the [Aboriginal Group] traditional territories that may be impacted by the Project...This impact may (and likely will) directly and adversely affect the ability of [Aboriginal Group]'s members to exercise their traditional harvesting rights in the Project area and LSA...[Aboriginal Group] submits that the Application should be denied due to disturbance of traditional plants and wildlife populations including culturally important species.</p>	<p>May 30, 2011</p> <p>September 28, 2012</p>	<p>Following discussion of this issue and clarification with the SREM Aboriginal Affairs Branch, CVRI representatives and legal counsel met with Aboriginal Group F Chief and Council and legal counsel in February, 2013 to discuss consultation matters related to the Project. Representatives from SAAB and Federal government agencies were also present. The parties agreed that there have been some communication issues in the past, but are moving forward on a more formal consultation process. At this meeting Les LaFleur provided a general overview of the Project and how it relates to existing Coal Valley operations, and answered council questions regarding potential environmental impacts. Les presented a document outlining what CVRI understood to be Aboriginal Group F concerns related to the Project, but legal counsel declined to enter into a discussion of those concerns. CVRI is currently considering a scope and cost proposal from Aboriginal Group F regarding a possible study of Aboriginal Group F traditional land use related to the Project area, and the parties will continue to meet to discuss Aboriginal Group F concerns related to the Project.</p> <p>The Project will affect wildlife and vegetation in the Project area but for short periods of time until reclamation activities can establish productive terrain. It should be noted that the Project is completed over a number of years and not all the lands will be disturbed at one time. CVRI promotes progressive reclamation and when the opportunity exists the mine will start to recontour and reclaim mined out lands as soon as possible. Mining is a temporary use of the land and reclamation activities aim to make this time as short as possible. Disturbance footprints are minimized as much as possible to decrease the overall effect on vegetation, wildlife and various other factors. CVRI also aims to maintain as much undisturbed habitat as possible during mining which will help to enhance the wildlife diversity of the reclaimed sites. A variety of wildlife uses on undisturbed and reclaimed habitat associated with coal leases during and after the mining phases has been documented. Wildlife have colonized new habitat created by reclamation of coal mines (MacCallum 2003). Activity associated with mining is predictable and focused. Animals are not subject to random and varied human disturbance within the MSL. These conditions allow animals to colonize the reclaimed landscape. The MSL associated with the CVM has provided a secure environment for wildlife and is instrumental in maintaining regional ungulate populations especially in the Critical Wildlife Habitat associated with the Lovett Ridge. Initial displacement of the existing wildlife community on the Project LSA by active mining will be followed relatively quickly by colonization of wildlife species appropriate to the stage of succession reached by the regenerated plant community. Given that appropriate habitats are established and movement opportunities are designed into the Project disturbance, wildlife are expected to adjust to the initial displacement and disturbance by colonizing newly available habitat and incorporating it into their daily and seasonal activities.</p> <p>CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecotype phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecotype phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecotype phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecotype phases which support TEK vegetation will be accessible in the RSA following removal of ecotype phases by the Project Footprint in the LSA. It is assumed that ecotype phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:</p> <ul style="list-style-type: none"> <li>• inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application;</li> <li>• working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and,</li> <li>• implementing a re-vegetation program which aims at the re-establishment of ecotypes common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecotypes will, over time, again support TEK vegetation.</li> </ul> <p>With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecotype phases within the LSA. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established.</p>
2	Potential Impact to Treaty or Aboriginal Rights	Hunting	<p>direct impact/removal of hunting locations in Project area</p> <p>loss of access to hunting locations in Project area</p> <p>displacement of game animals from Project area</p>	<p>She indicated that [Aboriginal Group] hunters had been neglected in this process...[Aboriginal Group] has literature dating back to 1896 supporting their use of the area. [Aboriginal Group] people work for the people of tomorrow, not just for those of today. They need places to sustain themselves in the future, there are people who still live off of the land, and they are getting crowded out by land uses. [Councillor] indicated that they had hunters going out now, and the young men want to learn, so their hunting population is actually growing...The council had decided that further review of the project was in order and would like to move toward a community review including interviews with specific users of the area such as hunters.</p> <p>[Aboriginal Group] harvesters depose that Project will impact wildlife populations beyond existing impacts, Project will further restrict rights of access to lands previously available to them to practice rights to hunt, fish, gather, trap.</p> <p>Hunt various species in or near Project area including moose, elk, deer (white-tail and mule), birds including grouse, ruffed grouse, ducks, geese, prairie chickens</p>	<p>February 13, 2013</p> <p>September 28, 2012</p> <p>September 28, 2012</p>	<p>CVRI representatives and legal counsel met with Aboriginal Group F Chief and Council and legal counsel in February, 2013 to discuss consultation matters related to the Project. CVRI is currently awaiting a scope and cost proposal from Aboriginal Group F regarding a possible study of Aboriginal Group F traditional land use related to the Project area, and the parties will continue to meet to discuss Aboriginal Group F concerns related to the Project. No Aboriginal group consulted to date has demonstrated through such studies that impacts from the Project will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake the Rights to hunt for food on Crown lands as protected under Treaty or undertake other traditional pursuits. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returned for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights to hunt during the development of the Project.</p> <p>The development of the Project, particularly the development of the mine pits, soil and rock stockpiles, dumps, and roads, will definitely impact plants and animals in the disturbance zones through displacement. Most wildlife will likely be displaced to adjacent habitat patches. Ungulates will be temporarily displaced by active mining as they are unable to cross a pit disturbance. This displacement will be restricted to local use as there are no indications of long distance or major seasons migrations in the LSA. Large amounts of moderate quality moose habitat is available throughout the RSA for moose thereby moderating the affect of habitat change caused by mining. High quality moose habitat on the Project and other areas associated with mixed wood of the Lovett Ridge will be reclaimed with a closed forest regeneration forest of lesser habitat quality. The impacts of the Project development on moose in the region can be mitigated by: implementing reclamation techniques appropriate for moose, establishing a variety of vegetation types and promoting understory complexity in regenerated forests that includes willow species, aligning reclamation and other re-vegetation efforts to maintain and improve moose habitat, taking steps to ensure core security areas are provided for wildlife, implementing appropriate monitoring, cooperating with the province and other industry on access management and other relevant management issues. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. It is expected that elk and deer will respond positively to the early stages of upland reclaimed and re-vegetated areas on the LSA particularly in the Robb West, Main and Central zones where there is extensive mixed wood and deciduous habitat adjacent the disturbance area. Many of the species on the CVM are birds associated with water habitats which would have been poorly represented in the pre-development ecosystem. While bird abundance and types of species may change as a result of mining activity it appears that the number of bird species will be similar or may increase as a result of adding new habitats e.g. upland grassland, shrubland, lake, pond and wetland development. The edge associated with the Project should enhance tree growth potential both natural and through reclamation planting as well as promoting maintenance of bird species occurrence during active mining. Reclaimed lakes and ponds on the CVM support breeding water birds, i.e., Canada Goose, Mallard, Bufflehead, Common Goldeneye, Barrow's Goldeneye, Killdeer, Greater Yellowlegs, Spotted Sandpiper; probably or possible breeding water birds i.e., Ring-necked Duck, Lesser Scaup, Solitary Sandpiper, summer visitants i.e. Common Loon, Osprey, and several species of waterfowl and shorebird migrants not seen elsewhere in the RSA, i.e., Semipalmated Sandpiper, Western Sandpiper, Least Sandpiper, Baird's Sandpiper, Short billed Dowitcher. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features.</p>
3	Potential Impact to Treaty or Aboriginal Rights	Trapping	displacement of fur-bearing animals from Project area	Trap various species in or near Project area including rabbit, lynx, beaver, weasel, muskrat	September 28, 2012	<p>A total of 22 Registered Fur Management Areas (RFMA) overlap in whole or in part with the RSA. Fur harvest return information for the period 1985 to 2001 was obtained from Alberta Sustainable Resource Development for the RFMA. Fur returns for 17 different species were reported. This included red squirrel (13,348), muskrat (3,649), beaver (3,401), marten (1,796), weasel spp. (1,531), coyote (896), wolf (236), lynx (133), mink (128), fisher (50), red fox (47), black bear (18), badger (14), striped-skunk (7), wolverine (6), river otter (4) and raccoon (1). The average numbers of captures per year per trap line for Valued Environmental Component (VEC) species were: lynx (0.42), marten (5.17), fisher (0.16), and wolf (0.71). RFMA 1516, 2619 and 2256 will be directly affected by the proposed development of the Project permit area. Over a 16 year period, RFMA 1516 reported an average number of lynx (0.4/year), fisher (0.19), marten (5.4/year) captures and reported below average wolf captures (0/year). Over a 15 year period, RFMA 2256 reported above average marten (8.5/year), and fisher (0.13) captures and below average lynx (0.3/year) and wolf (0.1/year) captures. Over a 17 year period, RFMA 2619 reported below average capture rates for lynx (0.2/year), marten (1.2), fisher (0.12), and wolf (0.6). Caution must be used when interpreting this data. Capture rates can vary widely and may reflect trapper effort and fur prices as much as it does of animal abundance. Capture rates can also reflect the size of the RFMA. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Contact and discussions have been held with people holding Registered Fur Management Area rights. Where required, agreements have been reached and compensation provided. Trapping is likely to continue in the RSA. Harvest levels are difficult to predict and are dependant largely on fur prices, RFMA tenure and levels of industrial activity. It is reasonable to assume that future trapping levels will occur at average levels from 1985 to 2001. As noted above, Project development will occur over time, and access to mine areas to undertake Treaty Rights to trap will be restricted in active mining areas for a period of time. However, areas surrounding the Project will still be available to undertake Treaty trapping rights, and Project development and reclamation will be complete by 2060, returning those lands for trapping uses.</p>

F	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
4	Potential Impact to Treaty or Aboriginal Rights	Fishing	direct loss of fish through mortality (water quality etc.) in Project area	Concerns with water hydrology and impacts of Project on environment and fish and fish habitat due to increased emissions and other impacts to water bodies in area used for traditional fishing purposes. Sediment. Chemical contaminants. Flow regime. Water quality. Access.	September 28, 2012	Access to the Project area to undertake Treaty fishing rights will be restricted during development, but that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent. The Project is not expected to have a negative effect on fish, with mitigation measures in place such as the "No Net Loss" (NNL) compensation plan. The Project is expected to have no effect on fish in the surrounding area, which will remain available for undertaking Treaty fishing rights. Activities associated with the Project that have potential to directly impact fish habitat and, consequently, fish populations will not extend into the RSA. The impacts to fish populations as a result of the mining and pit filling is expected to be minimal since it is assumed that downstream flows will be managed to adhere to instream flow guidelines (AENV 2011). In general, peak flows will be reduced and low flows will be increased. This attenuating effect may have some impact on fish habitat composition and could also benefit fish populations by reducing the intensity of high flow events that can adversely affect fish, particularly during the early life stages. Potential changes in surface water quality in the RSA were assessed as insignificant (Section E.11, CR# 11) and are not expected to significantly impact fish populations in the RSA. No additional access to water bodies in the RSA is expected to occur as a result of the Project.
			removal of fish resources/habitat in Project area	Fish in or near the Project area including whitefish, trout, grayling, jackfish, pickerel.	September 28, 2012	CVRI will monitor watercourses within the watersheds to be affected by the Project. Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including: <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval.</li> </ul> The surface hydrology assessment presents proposed water management plans and addresses the potential impact of the Project on: <ul style="list-style-type: none"> <li>• the quantity of surface water flow and stream behaviour during high, average and low flow conditions; and</li> <li>• sediment concentrations in local and regional streams.</li> </ul>
			removal of fish resources/habitat in Project area	[Legal counsel] indicated to DFO personnel that [Aboriginal Group] expected any analysis [presumably related to analysis of Robb Trend project water and fisheries reports] to be provided.	February 13, 2013	Various water management and sediment control measures will be implemented for the Project during operations, reclamation, and closure, including: 1) Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval; 2) Release of water pollutants from the site such as oil and grease is controlled. With the installation of oil booms on the impoundments and immediate containment of oil in the event of a spill, there is little danger of these materials contaminating surface waters. Components of the water handling system will be designed according to the governmental specification and the systems will be operated in accordance with regulatory approval requirements; and Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval; 3) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; and 4) All mine-affected water will be treated prior to its release in to the receiving waters to reduce potential effects from loading of suspended sediments and potential effects of water quality variables typically associated with suspended sediments (e.g., total aluminum and total iron). [continued below]
4a	continued from above			continued from above		[continued from above] CVRI will pay particular attention to selenium (see below). The mine wastewater treatment program similar to the one currently in use at the CVM will be established to minimize downstream siltation and minimize downstream effects on surface water quality; 5) With respect to selenium, the CVM will continue an effective water quality monitoring program including a focus on selenium concentrations. The objective will be to observe water quality relative to baseline values to identify any changes over time. Should a significant increase in selenium levels be noted an investigation will be undertaken to identify possible sources and mitigation plans will be implemented; 6) Where necessary, interim erosion/sediment control measures will be utilized until long-term protection can be effectively implemented; 7) Minimization of the time interval between clearing/grubbing and subsequent earthworks, particularly at or in the vicinity of watercourses or in areas susceptible to erosion; 8) Slope grading and stabilization techniques will be adopted. Slopes will be contoured to produce moderate slope angles to reduce erosion risk. Other stabilization techniques used to control erosion include: ditching above the cutslope to channel surface runoff away from the cutslope, leaving buffer (vegetation) strips between the construction site and a watercourse, placing large rock rip rap to stabilize slopes; 9) Whenever possible, construction activities in close proximity to watercourses will be carried out during periods of relatively low surface runoff in late fall, winter and early spring (from October to April). A 30 m buffer (vegetation) strip will be left between construction sites and watercourses except at stream crossings and diversions; 10) Temporary measures to control erosion before a vegetation cover is reestablished, including: diversion ditches, drainage control, check dams, sediment ponds, sumps and mulches; 11) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; 12) The design and construction of all stream crossings will be done in compliance with the Alberta Code of Practice for Watercourse Crossings and associated guidelines. This means that all stream crossings constructed by the Project will meet regulatory requirements for protection of fish resources and aquatic habitat; this will also effectively mitigate against effects on surface water quality.  Mining activities are expected to reduce high flows, and low flows are expected to either remain the same, slightly decrease or slightly increase. Annual runoff may have modest variations dependent on mining activities at the time (e.g. pit dewatering). Temporary water diversions will also contribute to some slight variations in flow quantity for short periods of time. Instream flows will be maintained by bypass pumping. Depending on the extent of the disturbance footprint within the watershed the significance to flow quantity may remain the same, increase or decrease depending on the mine progression and seasonal variability. Dewatering of the groundwater around or in the mine pits, to permit mining, increases surface flows. This is usually a minor flow component of the overall surface runoff rate from an area. The magnitude of the flows is small and regulated by pumps. If the sump or dewatering area is well laid out and separated from active mining, the effect on sediment loads can be negligible. Impoundments such as settling ponds or end pit ponds or lakes generally reduce downstream peak flows as a result of storage. Increases in low flows can result from a more gradual release of the water stored in the impoundment. Depending upon their size, pond evaporation losses may be significant at times but is near balanced with direct precipitation on an annual basis. Depending upon their size and efficiency, impoundments can reduce sediment loads significantly. End pit ponds will reduce flows when initially filling but can provide opportunities for enhancement. For open water bodies (lakes, ponds and to some extent wetlands), lake evaporation essentially replaces evapotranspiration in equation (1) above with groundwater having both an inflow and outflow component. After initial filling and stabilization of the groundwater level, such that the net regional groundwater recharge is the same as pre-mining, it may be assumed that groundwater inflow equals outflow on an average annual basis. It should be noted that even large differences in net groundwater inflow/outflow for the water bodies typically will have minor net surface flow impacts because of the small areas of the ponds relative to the basin sizes and the smaller groundwater flow component compared to the surface runoff component. Diversions will be sized and designed to convey peak flows safely considering the life of the diversion. As a result, water diversions do not impound water or cause losses due to infiltration (if lined) and, if returned to the same stream, will not affect the magnitude of downstream flows. All defined watercourse crossings will be designed, and constructed, to meet or exceed the regulatory requirements for approval under the provincial Water Act and the federal Fisheries Act and Navigable Waters Protection Act. If appropriately designed and constructed, these crossings will have negligible effect on flows or sediment loads to the streams. [continued below]
4a	continued from above			continued from above		[continued from above] Some of the species cited are not found in or near the Project area. Rainbow Trout were the most common and widespread species within the LSA and RSA and were found in 38 of the 42 waterbodies sampled during baseline fisheries investigations. Bull Trout, Burbot, Lake Chub, Longnose Sucker, and Spoonhead Sculpin were encountered much less frequently than Rainbow Trout but were still found at a number of different locations. Other species, including Arctic Grayling, Brook Stickleback, Brook Trout, Longnose Dace, Mountain Whitefish, Northern Pike, Pearl Dace, Trout-perch, and White Sucker were rare and were only found in one or two waterbodies. Arctic Grayling are listed as Sensitive and is considered a Species of Special Concern in Alberta (ASRD 2010). Populations have decreased in the past few decades. Threats provincially include increased harvest pressure from improved road accessibility, blocked migration routes and altered stream flow resulting from improperly placed culverts in newly constructed roads. Brook Trout are listed as an exotic/alien species (ASRD 2010). They were introduced into Alberta in the early 1900's and are abundant in many foothills streams and isolated lakes. Bull Trout are listed as Sensitive and is considered a Species of Special Concern in Alberta (ASRD 2010). Over-harvesting has led to a decline in population and while angling regulations may lead to recovery, habitat degradation and competition from introduced species may contribute to further declines. Introduced stocks of Rainbow Trout in Alberta are Secure. However, the native Athabasca Rainbow Trout population has suffered introgression from introduced trout in the Athabasca drainage system. The native species is currently considered At Risk (ASRD 2010) but Alberta's Endangered Species Conservation Committee has recommended that Athabasca Rainbow Trout be listed as Threatened under the Wildlife Act. Rainbow Trout (At Risk status) were widespread in the Project and were often the only species found, or historically reported, in study streams. As such the majority of watercourses had a moderate diversity ranking.  Aquatic resources issues related to construction, operation, and reclamation of the Project were generally linked to potential changes to physical habitat components, changes in flow regimes, changes in surface water quality, and changes in resource access. Measures to reduce or mitigate potential effects were identified using proven strategies and combined expertise of professionals. Potential local effects on the fisheries Valuable Environmental Component's (VEC) associated with direct habitat loss or alteration are expected to be fully mitigated with properly implemented mitigation strategies. CR #2 (Section 5.4) of the Project application provides details of the numerous mitigation strategies proposed to protect fish resources, in the areas of surface water management and erosion control, haulroad crossing construction, stream diversions, management of stream flows, public access restrictions, and habitat enhancement. Therefore, no cumulative effects on fisheries VECs associated with direct habitat loss or alteration are expected. Potential adverse effects relate primarily to direct physical habitat alteration/loss, changes in surface water hydrology and water quality issues. With mitigation there will be an insignificant impact on the fisheries VEC's. CVRI is currently working with the Department of Fisheries and Oceans Canada (DFO) in creating a conceptual compensation plan to be able to uphold the principle of 'No Net Loss' to fish habitat.

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5	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of medicinal plant species in Project area	Gather medicinal plants in or near Project area including roots (not specified), muskeg tea, sweet grass, willow, bark (not specified), sweet pine.	September 28, 2012	<p>CVRI is currently considering a scope and cost proposal from Aboriginal Group F regarding a possible study of Aboriginal Group F traditional land use related to the Project area, and the parties will continue to meet to discuss Aboriginal Group F concerns related to the Project. No Aboriginal group consulted to date has demonstrated through such studies that impacts from the Project will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake traditional pursuits such as the collecting of plants for food or ceremonial/medicinal purposes. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights and traditional uses during the development of the Project.</p> <p>CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5), including all of the species cited. Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species, including all of those cited, are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecosite phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecosite phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecosite phases which support TEK vegetation will be accessible in the RSA following removal of ecosite phases by the Project Footprint in the LSA. It is assumed that ecosite phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA.</p>
			removal of food plant species in Project area	Gather various berries in or near Project area including blueberries, high bush cranberries, low bush cranberries, raspberries, Saskatoon berries, strawberries, gooseberries, huckleberries, chokecherries	September 28, 2012	
			direct impact/removal of other resource harvesting locations in Project area	TEK/TLU work to date conducted to date is incomplete and deficient, [Aboriginal Group] expects a full and proper traditional use study with the Nation.	January 21, 2013	
6	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to water quality in Project area	Questions raised regarding the use of water by the mine and the impact on watercourses.	February 13, 2013	<p>The existing mine areas within the CVM have implemented a Water Management Plan in order to maintain clean water flows in local watercourses and to capture mine affected water for treatment. CVRI is planning on implementing a similar plan for the Project area to maintain water quality and quantity. Responses #4, 4a, and 4b provide more detailed discussion of CVRI's proposed measures to protect water resources in the area.</p>
7	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general effects on wildlife in Project area	Impact to culturally important species harvesting in hunting and trapping activities; grizzly bear (sacred species; at-risk species), marten (do not trap, but effect on will impact others), fisher (do not trap, but effect on will impact others), lynx (do not hunt, but effect on will impact others; at-risk species), wolf. Impacts, universally negative in direction, arise due to: habitat alteration, sensory disturbance and effective habitat loss, habitat fragmentation, direct mortality, barriers to movement.	September 28, 2012	<p>Grizzly bears will likely be displaced from portions of the Project mine footprint and permit area during the active mining period. Displacement will result from construction noise and blasting. At some point shortly after reclamation grizzly bears will be attracted to the herbaceous forage and ungulates on the Project mine footprint as was observed on the Luscar, Gregg River and CVM reclaimed mine areas. The mined lands will not act as a serious barrier to grizzly bears, with the possible exception of during active blasting and hauling. In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. The greatest threat to regional grizzly bear populations is human-caused mortality caused by legal and illegal hunting, self-defence kills by ungulate hunters, and vehicle/train collisions. Any land use that results in increased access or use of access by individuals carrying firearms is a threat to grizzly bear population persistence. Any roads with vehicle speeds greater than 70 kph also have potential to result in increased grizzly bear mortality. Sources of domestic garbage at the CVM are contained in appropriate secure containers and transported to the licensed landfill in Hinton as per the Approval conditions. Problem bear actions at mines in the Coal Branch region are of extremely limited occurrence. Grizzly bears actively select habitats and foods that provide them with the greatest possible net digestible energy (Hamer and Herrero 1983, Pritchard and Robbins 1989). Mining and subsequent reclamation of the existing CVM has significantly changed landscape structure, composition and food production in the permit area for grizzly bears. Mining and reclamation at the CVM has resulted in removal of tree canopies, leading to increases in availability of high energy herbaceous plant material (clover, thistles, legumes) and an increase in ungulates (elk, deer) responding to increased forage and edge habitat. There is strong evidence to suggest that ungulates and plants used for reclamation are sought and used extensively by grizzly bears occurring in the vicinity of the CVM area. Similar findings were observed in the existing Luscar and Gregg River mines (Stevens and Duval 2005; Kansas and Symbaluk 2011). Bears using the reclaimed Luscar and Gregg River mine lands were on average larger than bears in an adjacent un-mined Subalpine and the Gregg/Luscar permit block was considered to be an attractive habitat for grizzly bears and a source for enhanced cub production (Kansas 2005). If similar reclamation measures are used on the Project then impacts on grizzly bears from a habitat alteration perspective will likely be positive within 10 years post-construction. In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. This assertion is based on the fact that carrying of firearms is not permitted within any mine permit areas and traffic speed control is practiced. It is further supported by the fact that no grizzly bear mortalities have occurred on mine permit areas in 40+ years in the Coal Branch region (Symbaluk 2008). This does not diminish the seriousness of cumulative effects on grizzly bear mortality in the RSA and broader Yellowhead region.</p> <p>According to CR #7, Marten are listed as "Secure" by the Alberta Fish and Wildlife Division (2010), and winter tracking surveys from 2007 to 2011 indicate normal to above-normal marten densities throughout the RSA. Those surveys also indicate that marten trail densities in areas with past timber harvest were as high or higher than in areas without timber harvest. Based on the results of the wildlife studies it was concluded that marten will possibly avoid some high quality habitat during blasting and coal hauling during active mining, but this will be short to medium-term effect with limited demographic consequences. While marten utilize reclaimed mine habitats, at this point in natural succession they are reliant on remnant forest stands embedded within the CVM footprint. The following mitigation measures are recommended to increase marten habitat suitability and use of reclaimed mine lands: Marten use of regenerating stands may be enhance with the occurrence of dense shrub and coniferous regeneration (Poole et al. 2004; Thompson et al. 2008). Selected native shrubs and trees should be planted to increase security cover for marten and their prey (varying hare, red squirrel, voles and mice).</p> <p>According to CR #7, fishers are listed as Sensitive by the Alberta Fish and Wildlife Division (2010), and little is known of their ecology in the foothills of Alberta. They are an uncommon species in the RSA with occurrence linked to older mixedwood forests in the lower elevation eastern portions. This species is not commonly trapped in the RSA with harvest limited to eastern RFMAs. High and very high quality fisher habitat currently comprises about 6% of the Project mine permit area (LSA). Fisher tracks were observed in the Project permit area but at much lower (40 times) densities than marten. The greatest threats to regional fisher populations are habitat alteration at maternal denning sites and over-trapping. Over-trapping is unlikely to occur because fisher harvest is very low in the region and subject to quotas. [continued below]</p>

F	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
7a	continued from above			continued from above		<p>[continued from above] The government can reduce quotas at any time if concerns over regional fisher occurrence or population density arise. A study of habitat alteration showed the predicted supply of high and very high quality fisher habitat over time considering effects of the Project and other planned and reasonably foreseeable land uses. The supply of high/very high fisher habitat increases steadily over time with increases of 273% and 444% for the Embarras and Lendrum BMUs from baseline to T50. Based on the above evidence, the combined effects of the Project and past, present and future land actions on fisher populations are rated as insignificant.</p> <p>According to CR #7, the main potential causes of lynx mortality arising from the Project are: 1) vehicle collisions from coal haul; and, 2) fur harvest. Unlike cougars, lynx are not a big game species in Alberta. Therefore, increased legal hunting pressure due to improve human access will not likely occur. Trapping of lynx is quota-based and recent lynx harvest has not been excessive. Vehicle speeds are reduced on mines to &lt;70 kph further reducing the likelihood of vehicle collisions. Overall, it is predicted that development of the Project is unlikely to cause an increase in direct lynx mortality. After the immediate maximum effect of construction, the losses of lynx habitat are predicted to be ameliorated over time by natural aging of existing forests and regeneration of forest on reclaimed lands. Succession of early post-seral clear cuts and Project reclamation to young forest with abundance hare populations are the main reasons for projected increases in quality lynx habitat. Planned timber harvest in the RSA will provide an optimal mix of regenerating forest and older forest that lynx need for forage and reproduction (denning). Surface coal mining will offer the same conditions if mitigation measures recommended are followed; and, habitat supply projections for lynx predict that supply of high and very high quality lynx habitat will significantly increase from baseline to T50 in the RSA (277% in Embarras BMU and 193% in Lendrum BMU) largely because of planned timber harvest, beetle salvage and surface coal mining.</p> <p>According to CR #7, wolves are a common species in the LSA and RSA. From 1985 to 2001, a total of 14 wolves were trapped within the three RFMAs that overlap the LSA. Wolf trails were regularly observed during winter tracking surveys from 2007 to 2011 with travel and hunting occurring within the existing CVM permit area. Wolves are not a listed species at risk in Alberta or nationally. The greatest threats to regional wolf populations are human-caused mortality caused by legal and illegal hunting, fur harvest, and vehicle collisions. Wolves could also be affected by significant and large-scale regional declines in ungulate prey availability. It is unknown to what extent projected decreases in ungulate prey and wolf habitat will impact wolf populations. Wolves have inherently high fecundity and in a region with low human population levels (i.e. low mortality risk) are very unlikely to be extirpated in the RSA.</p> <p>In addition to mitigations mentioned above, proposed mitigation strategies to help protect these mammalian carnivore species include: 1) Monitor the effectiveness of measures designed to increase understory cover (downed woody debris, shrubs, tree density) on reclaimed mine lands for marten, fisher and lynx. Design a program that includes establishment of specific targets; 2) Monitor response of marten, fisher lynx to existing and planned mine land reclamation using winter tracking techniques; 3) Determine if habitats required for fisher maternal denning occur on or immediately adjacent to the Project and assess their levels of use by fisher; 4) Monitor the effectiveness of establishing and maintaining hiding cover for grizzly bears near Project edges and adjacent to main roads; 5) Measure and monitor human use levels of linear features during summer, winter and fall (hunting) seasons. Assign this as a primary task of the 'bear warden' position. Use this data to design road closure plans; 6) Monitor the effectiveness of voluntary and enforced road closures including gating; 7) Monitor and study specific use of the existing CVM and proposed Project by grizzly bears. Investigate the extent to which existing mines in the region serve as attractive forage sources for grizzlies, and study implications for subregional mortality. Consider non-intrusive methods including DNA hair snagging; 8) Continue long-term, multi-species winter monitoring of mammals (carnivores and prey) to regional habitat fragmentation using the tracking data conducted in 2007, 2009 and 2011 as a starting point.</p>
8	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to environmental quality in Project area	The habitat suitability decrease resulting in lost habitat from the Project is materially important for the culturally important species across all types of habitats...the mining activities will change lands in the Project area from closed forest to barren land and herb-dominated vegetation communities.	September 28, 2012	<p>In the impact zones of the Project area, considerable change to the current vegetation patterns will obviously occur. After initial topsoil placement, these areas may indeed be described as "barren," but relatively quickly the reclamation process will begin the natural succession that has and will characterize the development of the landscape's vegetation. The revegetation program proposed for the Project area will use experiences gained over the years at the CVM. Vegetation species will be selected to match site-specific conditions (slope position and exposure) that are consistent with the land use objectives; watershed, timber, wildlife, fisheries and aesthetics/recreation. Three seed mixes are currently being utilized at CVM; the standard mix was formulated for use in drier upland areas, the wetland mix is formulated for the revegetation of lower lying wetter sites and constructed wetlands and a native seed mix formulated to facilitate native succession. Traditional value plants will be identified in respect to their possible use as revegetation species. The revegetation program will plant the dominant tree species; either a conifer or deciduous species. Where reclamation stock is available suitable understory species will be inter-planted with the tree seedlings. Initial grass/legume seeding will be undertaken during the first growing season following minesoil placement. Fertilizing will be completed in the same year (and may be repeated once more on some sites within the next five years). Planting or seeding of native herbaceous stock and planting of woody species (shrubs and trees) will be completed by the fourth growing season following coversoil replacement. Woody species planting will only be done when the ground cover has become fully established and has progressed beyond the initial heavy growth phase. Vegetation on the reclaimed landscape will continue to change after the reclamation activities have been completed. Some of the species in the initial seed mix will not persist, allowing other native species to ingress. Many native species will establish from roots or seed in the replaced soil, and other species will ingress from surrounding areas. As noted above, reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. Given the timelines of forest succession, precise timelines for the development of a "climax community" in reclaimed areas are difficult to predict, but this "successional reclamation" process (Polster, 1989) will continue for several decades. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features. CVRI also aims to maintain as much undisturbed habitat as possible during mining will help to enhance the wildlife diversity of the reclaimed sites. Adjacent landscape features will be emulated in the reclamation plan allowing for the development of similar habitat. A variety of wildlife uses on undisturbed and reclaimed habitat associated with coal leases during and after the mining phases has been documented. Wildlife have colonized new habitat created by reclamation of coal mines (MacCallum 2003). Activity associated with mining is predictable and focused. Animals are not subject to random and varied human disturbance within the MSL. These conditions allow animals to colonize the reclaimed landscape. The MSL associated with the CVM has provided a secure environment for wildlife and is instrumental in maintaining regional ungulate populations especially in the Critical Wildlife Habitat associated with the Lovett Ridge. Initial displacement of the existing wildlife community on the Project LSA by active mining will be followed relatively quickly by colonization of wildlife species appropriate to the stage of succession reached by the regenerated plant community. Given that appropriate habitats are established and movement opportunities are designed into the Project disturbance, wildlife are expected to adjust to the initial displacement and disturbance by colonizing newly available habitat and incorporating it into their daily and seasonal activities.</p>
9	Potential Impact to Treaty or Aboriginal Rights	Hunting, Trapping, Fishing	loss of access to land available for hunting in Treaty 6 area	<p>[Aboriginal Group] harvester report that frequency of the exercise of harvesting rights is currently being impacted by development, further development in their traditional territory including this Project has potential to further negatively impact and erode traditional activities.</p> <p>Project impacts cannot be considered in isolation, cumulative effects of all development in area on reasonable ability to exercise Treaty Rights must be considered, too much land has been taken...[Aboriginal Group] is deeply concerned that the Project represents a significant taking up of Crown land by Alberta under Treaty No. 6.</p>	<p>September 28, 2012</p> <p>January 21, 2013</p>	<p>The Provincial and Federal Crowns are responsible for the administration of Crown lands with respect to the provisions entered into under Treaty 6 and modified by the Natural Resources Transfer Act. It is beyond the jurisdiction of CVRI to either quantify or comment on the overall effects of the Crown's "taking up of land" as allowed under the Treaty in the past century and a half across the Provinces of Alberta and Saskatchewan as it relates to Aboriginal Group F or any other Aboriginal group. That being said, no Aboriginal group consulted to date has demonstrated that access restrictions to the Project area will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake the Rights to hunt, fish, and trap for food on Crown lands as protected under Treaty or undertake other traditional pursuits. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights and traditional uses during the development of the Project.</p>
10	Potential Impact to Treaty or Aboriginal Right	Traditional Use	general effect on environmental quality in surrounding region	Habitat loss will directly and adversely affect these traditional practices within both the LSA and RSA, EA demonstrates a material impact...Clear that many species in Project area and LSA already under stress.	September 28, 2012	<p>The EA does not demonstrate a material effect on Aboriginal Group F's Treaty Rights to hunt, fish, and trap for food, either through habitat loss or access restrictions. CVRI notes that courts have interpreted jurisprudence to indicate that the protection of a right does not guarantee its exercise in an "unspoiled wilderness" or in one particular location (Halfway River 1999: 140-141). Nor does the EA make it "clear" that many species in the Project area are already under stress. In fact, in the vast majority of cases, just the opposite is indicated. That being said, CVRI understands that the Project will have some direct effect on both habitat and wildlife during the course if its development as discussed in these responses. The Project will affect wildlife and vegetation in the area but for short periods of time until reclamation activities can establish productive terrain. It should be noted that the Project is completed over a number of years and not all the lands will be disturbed at one time. CVRI promotes progressive reclamation and when the opportunity exists the mine will start to recontour and reclaim mined out lands as soon as possible. Mining is a temporary use of the land and reclamation activities aim to make this time as short as possible. Disturbance footprints are minimized as much as possible to decrease the overall effect on vegetation, wildlife and various other factors. CVRI also aims to maintain as much undisturbed habitat as possible during mining which will help to enhance the wildlife diversity of the reclaimed sites. CVRI's reclamation objective for the CVM is to reclaim mined lands to meet equivalent land capability with the intended end land uses. The achievement of this objective assures that mining is a temporary use of the land. A variety of wildlife use on undisturbed and reclaimed habitat associated with coal leases during and after the mining phase has been documented. Wildlife have colonized new habitat created by reclamation of coal mines (MacCallum 2003). Activity associated with mining is predictable and focused. Animals are not subject to random and varied human disturbance within the MSL. These conditions allow animals to colonize the reclaimed landscape. The MSL associated with the CVM has provided a secure environment for wildlife and is instrumental in maintaining regional ungulate populations especially in the Critical Wildlife Habitat associated with the Lovett Ridge. Initial displacement of the existing wildlife community on the Project LSA by active mining will be followed relatively quickly by colonization of wildlife species appropriate to the stage of succession reached by the regenerated plant community. The Project will affect wildlife and vegetation in the area but for short periods of time until reclamation activities can establish.</p>

F	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
11	Consultation	Consultation	Consultation	<p>[Individual] indicated that all consultation with the [other Aboriginal Group] needed to go through her. [Individual] stated that [other Aboriginal Group] were [Aboriginal Group], and that for protocol reasons all consultation needed to go through her. [Individual] indicated and Dan agreed that to resolve this issue a meeting with Donna Hovsepian, CVRI, [individual], and [individual] should be convened to discuss the matter. [Individual] indicated that had Dan contacted her regarding the Project, she would likely just have had him contact [other Aboriginal Group], but everything needed to go through her. [Individual] then noted that it was she, not Dan, that was related to the people up there, she was glad that they went back in the 1960s to "reclaim the mountains for them," and that other [Aboriginal Group] went up there too. Dan replied that that portion of the [Aboriginal Group] community who made most use of the area and would be impacted by the Project were the [other Aboriginal Group]. [Individual] agreed, but noted that others do still go up there.</p> <p>[Aboriginal Group] submits that at minimum oral hearing necessary for ERCB to consider how Project may impact [Aboriginal Group]'s rights, and if approved what conditions needed. Request for participatory rights in ERCB proceedings "if it appears to the Board that its decision on an application may directly and adversely affect the rights" of that party.</p> <p>Application fails to explain specifically how CVRI will reduce or mitigate impacts specifically with respect to [Aboriginal Group]'s constitutionally entrenched and protected Aboriginal and Treaty rights. Absent a proposal to specifically address potential direct and adverse impacts to [Aboriginal Group] Aboriginal and Treaty rights, there exists a real risk that if approved, Project effects on culturally important species will be direct and adverse.</p> <p>Objects to process on basis of purported consultation with [other Aboriginal Group] and [Aboriginal Group]. To date CVRI not taken any steps to engage [Aboriginal Group]'s elected chief and council or consultation staff in a meaningful way, and consultation activities cannot be invoked in support of the application.</p> <p>Reliance on Alberta Policy, not "law." Alberta's consultation Policy was rejected by Treaty chiefs because it fails to acknowledge the Crown's "duty to accommodate."</p> <p>United Nations Declaration on the Rights of Indigenous Peoples must also guide consultation on resource projects.</p> <p>Impossible to continue a consultation that never began – only one meeting has occurred.</p> <p>Coal Valley has failed to review previously supplied concerns with the project presented in September, 2012.</p> <p>When [Aboriginal Group] members, including those who reside at [other Aboriginal Group], hunt, fish, trap, and conduct other traditional land uses in the Project area and surrounding lands, they are exercising the Treaty and Aboriginal rights of the [Aboriginal Group]. Accordingly, consultation regarding the adverse impacts of the Project on our Treaty and Aboriginal rights can only legitimately occur with the [Aboriginal Group] through our Council which is democratically elected to represent the Nation...CVRI, Canada, and Alberta have engaged a select group of [Aboriginal Group] individuals in an effort to circumvent the requirements of duty to consult with [Aboriginal Group]...Delegation of authority to consult with [other Aboriginal Group] as [Aboriginal Group] members has not been given, agreement invalid and cannot satisfy any aspect of duty to consult.</p> <p>[Aboriginal Group] was here because they think the consultation process was not done correctly...Coal Valley has met with the [other Aboriginal Group], that is not [Aboriginal Group], it is not Chief and Council. Although interviews etc. had happened out there, the proper starting point was here [clearly referring to the meeting with Chief and Council]. [Individual] indicated that when the whole consultation process started, both parties were "young" at consultation, and there was a learning curve, but now all are better at it. [Individual] indicated that a few things would be expected such as properly done aboriginal consultation including a presentation to Chief and Council and a presentation to the people, and to hire [Aboriginal Group]'s consultant with industry paying for it [presumably for any traditional use studies]. [Individual] indicated that the process needed to start over...It was noted by [Aboriginal Group] that their prime objective was to make sure the [other Aboriginal Group] was adequately protected in the process.</p>	<p>August 16, 2011</p> <p>September 28, 2012</p> <p>September 28, 2012</p> <p>September 28, 2012</p> <p>January 21, 2013</p> <p>January 21, 2013</p> <p>January 21, 2013</p> <p>January 21, 2013</p> <p>January 21, 2013</p> <p>February 13, 2013</p>	<p>CVRI understands Aboriginal Group F's position that consultation with the other Aboriginal group in question does not constitute consultation with Aboriginal Group F. Both SAAB and CEAA have also indicated their understanding of this, and SAAB has clarified that CVRI is required to continue consultation directly with Aboriginal Group F. CVRI notes that it has made efforts to engage Aboriginal Group F directly on its expansion projects, including the Robb Trend, beginning in 2006. This has included the sharing of information and documents including the Aboriginal Consultation Plan and Plain Language Project description, the proposed Terms of Reference, final Terms of Reference, the Federal Project Agreement, the Project Application, responses to Supplemental Information Requests, and other update notifications and information newsletters. As noted above, at a meeting in February 2013 both parties acknowledged that there had been communication issues, but are working together to move the consultation process forward in a mutually agreeable form. Currently, CVRI is considering a formal proposal on a scope and scale of traditional use studies involving Aboriginal Group F associated with the Project area. This continuing consultation process should make meaningful progress in addressing, mitigating, or accommodating any identified project-specific potential impacts to Aboriginal Group F Treaty Rights and traditional uses of the Project area. Any Aboriginal Group F concerns brought forward to date through the consultation process or the submission of a Statement of Concern are addressed in this table. CVRI attempted to discuss some of them directly with Chief and Council during the meeting in February 2013, but Aboriginal Group F legal counsel indicated an unwillingness to do so at that time. CVRI welcomes Aboriginal Group F comment on the responses, mitigations, or accommodations proposed here. The continuing consultation process will entail further discussion of these issues and others raised by and with Aboriginal Group F on a range of matters from potential impacts to Treaty Rights and traditional uses, to employment and contracting opportunities, to issues of community support. CVRI understands that Aboriginal Group F along with the other Treaty 6 Chiefs have rejected the Province's consultation policies and guidelines. Although technically correct that these policies and guidelines are not "law," they were developed in response to applicable jurisprudence, notably several important Supreme Court of Canada decisions, and follow the Court's guidelines resulting from those decisions. While seeking regulatory approvals, CVRI must in fact follow the Government of Alberta expectations for consultation as outlined in those guidelines. The Crown is ultimately responsible for consultation given that the Duty to Consult is vested in the Honour of the Crown, not CVRI to whom only aspects of the consultation process have been delegated. Therefore, discussion of the process of consultation, Treaty 6 Chiefs concerns with it, and specific issues such as the potential inclusion of the U.N. Declaration on the Rights of Indigenous People is an issue that needs to be raised with the Crown. One of the purposes for the inclusion of concerns such as this into this record is to help communicate on-going concerns with the consultation process to the Crown. That being said, CVRI stands by its record and believes that its consultation plan and activities to date, including proposed mitigations and accommodations, have exceeded Crown expectations and those expected from relevant jurisprudence. CVRI has been consulting with Aboriginal Group F on the Robb Trend Project, and believes that its efforts on the delegated aspects of the consultation process can be considered reasonable in the assessment of adequacy. It is working with potentially affected Aboriginal groups, including Aboriginal Group F, to understand, address, and accommodate potential impacts to Treaty Rights and traditional uses, and to provide other potential benefits to Aboriginal communities from the development of the Project where appropriate.</p>
12	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	[Individual] stated that [Aboriginal Group] had its own water monitors, well trained and including staff for traditional use studies.	February 13, 2013	CVRI is responsible for environmental monitoring and retains qualified staff for these duties. Employment for such positions are available through the CVRI hiring policy.

G	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	general traditional use concerns	general traditional use concerns	Following initial discussions, [Aboriginal Group] Elders indicated likely at least 1 traditional site in the Robb Trend, studies would be required.	October 3, 2006	CVRI has been consulting with Aboriginal Group G since 2006 regarding its proposed projects including the Robb Trend Project, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Through many discussions and two sets of traditional use studies and field visits, the community had opportunity to voice its concerns about the Project, which included concerns related to traditional use sites in the region and possibly associated with the Project area. The conclusion of the October, 2007 traditional use report states: "Through the collective and cooperative effort of the three [Aboriginal Groups] and Coal Valley Mine representatives, consultation has occurred that has led to the identification of culturally significant sites and livelihood component parts to current day practice. The mitigative measures determined by all parties gives comfort that, if followed, the three groups will see a continuation of availability for future exercise of their way of life. Any authorizations forthcoming are contingent upon written conformation by Coal Valley Resources Inc., of agreement to the mitigative measures and outstanding cost payment." Such written confirmation was provided by Mel Williams in December, 2007. In letters dated December 7, 2007 and March 17, 2011 Aboriginal Group G indicated that any impacts to culturally significant sites had been mitigated by CVRI through a meaningful consultation process, and provided its authorization for the Project and continued Coal Valley development to proceed. A written agreement is in place between the parties providing for continuing avoidance of some sites in the vicinity of Coal Valley operations important to Aboriginal Group G and continuing annual consultation on Coal Valley operations. CVRI continues to consult with Aboriginal Group G on the Robb Trend Project and its other operations. As discussed in some of the responses below and on other Aboriginal concern response tables, and as detailed in the Environmental Assessment, CVRI has a number of strategies in place to mitigate any Project effects on wildlife and the environment. To date, no Aboriginal Group has demonstrated that the development of the Project will have a particularly deleterious, non-mitigable effect on Rights to hunt, fish, and trap for food. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Rights and undertake traditional activities will not be curtailed in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group G, to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Rights and traditional uses during the development of the Project.
				"Upon completion of the survey many areas within the project area were identified to have and to continue to support the three groups traditional use. In the modern day the use continues to support hunting/ gathering activities as well as ceremonial functions. Ceremonial herb gathering and the actual ceremonies are prominent in the area to this day. Much of the project area traverses the traditional and present day hunting area frequented by all three groups."	October 2007	
				Additions to Robb Trend project need map review, likely field studies/visits.	March 17, 2011	
				Site visit requested following map review of Robb West and the 3 road corridors.	May 3, 2011	
2	Potential Impact to Treaty or Aboriginal Rights	Hunting	loss of access to specific hunting locations in Project area	"In the same area as the grave sites exists a current hunting area, with the presence of an integral part of moose habitat that can also be mitigated by the buffer area used to protect the grave sites."	October 2007	The October, 2007 traditional use report states that "To mitigate the impacts to the grave sites and moose habitat, it was suggested and agreed that an adjustment to the project of an agreed upon set back from the prescribed area is needed. This set back area for the moose habitat and graves sites are incorporated an indicated in a revised project area map. This map is provided as Attachment 1." These terms form part of the agreement between CVRI and Aboriginal Group G which led to the letters of December 7, 2007 and March 17, 2011 in which Aboriginal Group G indicated that any impacts to culturally significant sites had been mitigated by CVRI through a meaningful consultation process, and provided its authorization for the Project and continued Coal Valley development to proceed.
3	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of medicinal and food plant species in Project area	Request to consider using [other Aboriginal Group]/[Aboriginal Group] members to replant during reclamation activities.	September 6, 2007	The discussion of proper mitigation efforts during consultation led to the agreement on the process as outlined in the October 2007 traditional land use report: "To ensure that impacts to specific medicinal herbs and ceremonial plants are properly mitigated, a progressive project impacts assessment will be implemented on an annual basis. The following regiment will be set into action: An annual, detailed activities impact map will be generated by CVM to show the actual disturbance area proposed. This map will be reviewed to determine proximity to any identified site.; CVM will provide a review of the plant list to determine rarity and risk potential.; Acceptable alternative sources of 'at risk rare' plants will be identified (if possible); if no other source for at risk plants are found transplantation options will be explored. Any transplanting attempt will follow appropriate aboriginal protocol.; In the event transplanting is not possible, avoidance will be applied to the operations planning. ; The process for mitigation of the herbs, plants, and eatables may require a process of harvesting, nurturing, and replanting. Select members from each group would be contracted to participate in the transplanting activity incorporating all three groups protocols and ceremonial requirements. Follow-up plant survival review would be planned and conducted." These terms form part of the agreement between CVRI and Aboriginal Group G which led to the letters of December 7, 2007 and March 17, 2011 in which Aboriginal Group G indicated that any impacts to culturally significant sites had been mitigated by CVRI through a meaningful consultation process, and provided its authorization for the Project and continued Coal Valley development to proceed.  CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses, including those identified by Aboriginal Group G. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecosite phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecosite phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecosite phases which support TEK vegetation will be accessible in the RSA following removal of ecosite phases by the Project Footprint in the LSA. It is assumed that ecosite phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:  • inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application; • working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and, • implementing a re-vegetation program which aims at the re-establishment of ecosites common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecosites will, over time, again support TEK vegetation.  With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecosite phases within the LSA. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established. CVRI will continue the consultation with the Aboriginal groups as information is brought forward regarding specific impacts to traditional uses as well as undertake further discussions with Aboriginal groups on specific impacts and mitigation measures. Negotiations with Aboriginal groups will also continue on a case by case basis for avoidance of specific plant species if possible. Not all of the Project area will be disturbed at one time. CVRI can work with local Aboriginal groups to identify periods of time in certain locations (undisturbed by mining and safe to access) in which berry picking and medicinal plant gathering can occur.  TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions. These ecosites will be targeted in the reclamation process in order to provide the traditional knowledge and native plant species an environment suitable for survival. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation.
				"Throughout the project area the three groups found and identified numerous medicinal herbs, ceremonial plants, and food source roots and berries. Mitigative measures for this component require strict adherence to [Aboriginal Group] custom, tradition, and method."	October 2007	
				Proper mitigation measures for plants, transplanting, ceremonies, rarity.	October 17, 2007	
				The October 2007 traditional use report includes the following list of important plants: Seneca snake root, soapberry (buffaloberry), Balsam fir, Alsike clover, Red baneberry, blueberries (low bush blueberries, high bush blueberries, huckleberries), raspberries, mountain cranberries, yarrow, wild strawberries, Labrador tea, cow parsnip, spiny wood fern, horsetail, fireweed, common bearberry, bunchberry, tamarack, Saskatoon, ox-eye daisy, lichen, moss fungus, lodgepole pine, twisted stalk, liverberry, juniper, false solomon seal, mooseberry, wild sarsaparilla, clematis, mountain ash, bracted honeysuckle, gooseberry, wintergreen, wild mint, arrowhead, ratroot, poplar bark."	October 2007	
				During field visit to Robb West, Bryan Corridor, and Erith Corridor the Elders noted that there were no burials or other concerns, but that there were important plants all over.	June 2, 2011	
				During field visit to Halpenny Corridor the Elders noted that there were many medicines in the area.	August 23, 2011	
				Discussion of the existing agreement to provide annual maps and opportunity for harvesting plants prior to disturbance.	December 10, 2012	

G	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
4	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of burials in Project area	<p>Discussion of burials which look like they are outside of project boundary.</p> <p>Question regarding "sacred burial" sites and what is done.</p> <p>Request to avoid grave sites near Robb Trend</p> <p>Issue of buffer zones for important sites discussed.</p> <p>"Grave sites have been identified in the south-central region of the project area. The project area is very close to the grave sites, therefore, discussions with Coal Valley Mine have lead to agreeable mitigative measure."</p> <p>Discussion of production of maps to verify continued avoidance of burials near Robb Trend.</p> <p>Discussion of production of maps to verify continued avoidance of burials near Robb Trend.</p>	<p>June 18, 2007</p> <p>August 9, 2007</p> <p>September 6, 2007</p> <p>October 17, 2007</p> <p>October 2007</p> <p>March 17, 2011</p> <p>December 10, 2012</p>	<p>Discussions on the topic of important sites, most notably burials, resulted not in the application of a generic buffer zone but rather specific areas of avoidance for the sites in question. "To mitigate the impacts to the grave sites and moose habitat, it was suggested and agreed that an adjustment to the project of an agreed upon set back from the prescribed area is needed. This set back area for the moose habitat and graves sites are incorporated as indicated in a revised project area map. This map is provided as Attachment 1." These terms form part of the agreement between CVRI and Aboriginal Group G which led to the letters of December 7, 2007 and March 17, 2011 in which Aboriginal Group G indicated that any impacts to culturally significant sites had been mitigated by CVRI through a meaningful consultation process, and provided its authorization for the Project and continued Coal Valley development to proceed. Regarding the specific burials in question, the area in question is located outside of the currently proposed Project boundary, and CVRI is still to provide maps verifying to Aboriginal Group G elders that this is true. Regarding any unrecorded burials, if during operations possible burials are encountered in the Project area, CVRI is prepared to work with Aboriginal communities and regulators to confirm burial association and devise an appropriate avoidance or mitigation strategy. The presence of human remains or burials on Project lands, whether Aboriginal or not, is subject to Federal and Provincial laws and regulations including Section 182 of the Criminal Code, the Alberta Cemeteries Act, and potentially the Alberta Historical Resources Act. Knowingly disturbing human remains (improper interference) without legal authorization constitutes a criminal act, and knowingly disturbing burials, recorded or not, without legal authorization contravenes the Cemeteries Act and potentially the Historical Resources Act. In addition to moral duties, sanctions of both a criminal and financial nature for any actions provide significant impetus for CVRI to act swiftly and accordingly should potential burials be identified during development activities. Mine management will ensure that all supervisors and workers are aware of the legal and moral issues regarding possible burials.</p>
5	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of ceremonial locations in Project area	The October 2007 traditional use report provides the UTM coordinates for several burials, campsites, and a "homestead."	October 2007	The October 2007 traditional use report provides the UTM coordinates for several burials, campsites, and a "homestead." None of these sites are within the proposed Robb Trend Project permit area. The two burials nearest the Robb Trend have been mitigated through agreed-to avoidance as discussed above. The remaining sites are located well outside of the Robb Trend Project area. CVRI has maintained discussion with Aboriginal Group G regarding these sites and others of importance in the region. On December 10, 2012 CVRI and [Aboriginal Group] continued to engage on some of these sites, which are located outside of the Robb Trend Project, to ensure continued avoidance or mitigation if required. As also noted above, CVRI is to provide mapping information again demonstrating the Aboriginal Group G elders the continued avoidance of these sites.
6	Ceremonial Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	[Elder] then inquired about donations for ceremonies etc. Les then inquired about Christmas hampers. [Individual] then described a big New Year's Feast, with up to 50 children in attendance, characterized by a tradition where everyone shows up and shake hands with one another regardless of personal animosity. Les then offered a donation and indicated that he would send a cheque.	December 10, 2012	CVRI has and will continue to support Aboriginal Group G community programs such as this through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration.

H	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	Hunting and Fishing	general hunting and fishing	[Individual] stated that [Aboriginal Group] often have concerns regarding fish and wildlife	October 1, 2009	As discussed in some of the responses, and as detailed in the Environmental Assessment, CVRI has a number of strategies in place to mitigate any Project effects on fish and wildlife. To date, no Aboriginal Group has demonstrated that the development of the Project will have a particularly deleterious, non-mitigable effect on Rights to hunt, fish, and trap for food.
2	Potential Impact to Treaty or Aboriginal Rights	Hunting	loss of access to specific hunting locations in Project area	Community member stated "there are some [Aboriginal Group] traditional hunters that use that Dennison area on the Robb Trend."	October 23, 2008	CVRI has been consulting with Aboriginal Group H and its membership on its proposed developments including the Robb Trend since 2007, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Through meetings with Aboriginal Group H leadership, meetings or open houses in Hinton, Robb, and Edson, and surveys sent to Aboriginal Group H membership, community members have had the opportunity to express their views on the Project and communicate any concerns to Aboriginal Group H leadership or to CVRI directly. As discussed in some of the responses below and on other Aboriginal concern response tables, and as detailed in the Environmental Assessment, CVRI has a number of strategies in place to mitigate any Project effects on fish and wildlife. To date, no Aboriginal Group has demonstrated that the development of the Project will have a particularly deleterious, non-mitigable effect on Rights to hunt, fish, and trap for food. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Rights and traditional uses during the development of the Project.
				[Individual] and [Individual] stated there are people who hunt in the area and would want to contact them	November 10, 2009	
3	Potential Impact to Treaty or Aboriginal Rights	Hunting	access to hunting locations in Project area	Community member stated in regards to reclamation of the area "when we as hunters etc. go out there, we don't understand why growth is not back yet, why its not accessible, and you're taking another section ahead"	October 23, 2008	The Project will affect wildlife and vegetation in the area but for short periods of time until reclamation activities can establish. It should be noted that the Project is completed over a number of years and not all the lands will be disturbed at one time. CVRI promotes progressive reclamation and when the opportunity exists the mine will start to recontour and reclaim mined out lands as soon as possible. Mining is a temporary use of the land and reclamation activities aim to make this time as short as possible. Controlled public access may be permitted in or through those areas of the Mineral Surface Lease (MSL) where mining activities have been completed but are not actively occurring, which are distant from mining operations, and where wildlife values would not be jeopardized. Within active mining and reclamation operations, no public access will be permitted for safety reasons (for CVRI employees and the public). After reclamation activities have been completed and the vegetation cover is established and self-sustaining, limited access may be considered. Access may only be permitted through selected reclaimed areas on designated trails. This will accommodate those persons interested in gaining access to areas in behind the MSL. This system is similar to that currently in place on areas of the CVM (e.g., the trail to Silkstone and Lovett Lakes; access to Lovettville). Time limitations to trail use may apply, as determined through government and public consultations.  Initial grass/legume seeding will be undertaken during the first growing season following minesoil placement. Fertilizing will be completed in the same year (and may be repeated once more on some sites within the next five years). Planting or seeding of native herbaceous stock and planting of woody species (shrubs and trees) will be completed by the fourth growing season following coversoil replacement. Woody species planting will only be done when the ground cover has become fully established and has progressed beyond the initial heavy growth phase. Vegetation on the reclaimed landscape will continue to change after the reclamation activities have been completed. Some of the species in the initial seed mix will not persist, allowing other native species to ingress. Many native species will establish from roots or seed in the replaced soil, and other species will ingress from surrounding areas. As reclaimed lands receive reclamation certification, and the MSL is dropped, greater levels of human use on certain areas of the reclaimed landscape may be considered. The reintroduction of human activities will be deliberately planned so that environmental conditions on the reclaimed sites and wildlife patterns are considered. Land and access management at this phase would be the responsibility of the provincial land management agencies.
				Community member asked "you have areas of several different growth ages of trees, any of it ready to come back?"	October 23, 2008	
4	Potential Impact to Treaty or Aboriginal Rights	Hunting	displacement of game animals from Project area	[Individual] stated "looking for breeding grounds etc. It will compact caribou, I know in your area will impact sheep"	October 1, 2009	Based on the in-depth wildlife assessment completed for the Project as well as past wildlife studies within the CVM and ongoing studies, no caribou or sheep populations have been identified in the Project area. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features



H	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
5	Potential Impact to Treaty or Aboriginal Rights	Trapping	general trapping concern	[Individual] inquired if there was a trapper's association report and they would like a copy	October 1, 2009	A total of 22 Registered Fur Management Areas (RFMAs) overlap in whole or in part with the RSA. Fur harvest return information for the period 1985 to 2001 was obtained from Alberta Sustainable Resource Development for the RFMA. Fur returns for 17 different species were reported. This included red squirrel (13,348), muskrat (3,649), beaver (3,401), marten (1,796), weasel spp. (1,531), coyote (896), wolf (236), lynx (133), mink (128), fisher (50), red fox (47), black bear (18), badger (14), striped-skunk (7), wolverine (6), river otter (4) and raccoon (1). The average numbers of captures per year per trap line for Valued Environmental Component (VEC) species were: lynx (0.42), marten (5.17), fisher (0.16), and wolf (0.71). RFMAs 1516, 2619 and 2256 will be directly affected by the proposed development of the Project permit area. Over a 16 year period, RFMA 1516 reported an average number of lynx (0.4/year), fisher (0.19), marten (5.4/year) captures and reported below average wolf captures (0/year). Over a 15 year period, RFMA 2256 reported above average marten (8.5/year), and fisher (0.13) captures and below average lynx (0.3/year) and wolf (0.1/year) captures. Over a 17 year period, RFMA 2619 reported below average capture rates for lynx (0.2/year), marten (1.2), fisher (0.12), and wolf (0.6). Caution must be used when interpreting this data. Capture rates can vary widely and may reflect trapper effort and fur prices as much as it does of animal abundance. Capture rates can also reflect the size of the RFMA. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Contact and discussions have been held with people holding Registered Fur Management Area rights. Where required, agreements have been reached and compensation provided. Trapping is likely to continue in the RSA. Harvest levels are difficult to predict and are dependant largely on fur prices, RFMA tenure and levels of industrial activity. It is reasonable to assume that future trapping levels will occur at average levels from 1985 to 2001. As noted above, Project development will occur over time, and access to mine areas to undertake Treaty Rights to trap will be restricted in active mining areas for a period of time. However, areas surrounding the Project will still be available to undertake Treaty trapping rights, and Project development and reclamation will be complete by 2060, returning those lands for trapping uses.
6	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of medicinal plant species in Project area	[Individual] expressed concern over the protection of resources (She stated previous incident that in a special area for traditional medicines near Obed, there was a special orchid and some contamination happened close to this area, the communities wanted to protect it but did not have the resources)	October 4, 2011	To date, no Aboriginal group consulted has indicated the presence of a specific medicinal plant gathering location present in the Robb Trend. While numerous patches of plants traditionally used for medicines have been observed and recorded, CVRI is unaware of a specific patch that is either frequently used or particularly rare or important. Mining activities will remove any medicinal plants currently growing within the disturbance footprint. Over the short, medium, and long-term, many of these plants will become re-established following reclamation. Some of these plants will re-establish naturally after soil replacement from seeds or plant communities in adjacent areas. None of the medicinal plants important to Aboriginal communities identified to CVRI are rare plant species, nor are they uncommon in the surrounding region. CVRI will work with Aboriginal groups to help specific plants return during the reclamation process. CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. In total, 574 vegetation species were documented during field surveys within the LSA. Of these, 345 were vascular and included 9 trees, 62 shrubs, 193 forbs and 81 graminoids, and 229 were non-vascular and included 134 bryophytes and 95 lichens. Forty-six vegetation species documented during field surveys in the LSA are on the ACIMS Alberta Rare Plant Tracking and Watch Lists (Table E.13-5). Of these, 20 are vascular plants (with 38 occurrences), 18 are bryophytes (with 40 occurrences), and 7 are lichens (with 9 occurrences). Additionally, one occurrence each of Chrysozomium lowense (golden saxifrage), the crust lichen Lecidea leprarioides, and Conocephalum conicum (snake liverwort) were observed within 500 m outside the LSA boundary. No plants observed in the Project area are listed as potentially being extinct. The comment provided refers to a new, and rare species of orchid documented in the Marlboro area, far outside of the Project area.
7	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of food plant species in Project area	[Individual] and [Individual] stated that there are some people who collect huckleberries in the area and would like to contact them regarding the project	November 10, 2009	Not all of the Project area will be disturbed at one time. CVRI can work with local Aboriginal groups to identify periods of time in certain locations (undisturbed by mining and safe to access) in which berry picking and medicinal plant gathering can occur.
8	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	reclamation with native species using traditional knowledge	[Individual] stated that "reclamation will be a big issue, when I bring my mom out it is"  [Individual] asked if there was an opportunity to get people involved and that she would like young people involved. She also stated that it would be good to teach young people the science involved in reclamation	February 23, 2011  October 2, 2011	CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecotone phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total, 2,264.9 ha of ecotone phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecotone phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecotone phases which support TEK vegetation will be accessible in the RSA following removal of ecotone phases by the Project Footprint in the LSA. It is assumed that ecotone phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:  <ul style="list-style-type: none"> <li>• inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application;</li> <li>• working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and,</li> <li>• implementing a re-vegetation program which aims at the re-establishment of ecotone common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecotones will, over time, again support TEK vegetation.</li> </ul> With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecotone phases within the LSA. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established.
9	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of burials in Project area	Community member questioned what would happen if burials were encountered  [Individual] expressed that she has two elders who want to look at the project area because there is a cemetery	October 23, 2008  November 10, 2009	To date no Aboriginal group has notified CVRI of the location of a burial within the Robb Trend Project area. Some Aboriginal burials and non-Aboriginal burials in the general area are known to CVRI, the locations of which are privy to those who have identified their locations. CVRI has previously modified its proposed Robb Trend permit area removing some known burials from the Project lands, none of which are associated with Aboriginal Group H. CVRI is fully prepared to work with Aboriginal communities to avoid burials identified or undertake other mitigative options. There are a number of small cemeteries in the region associated with the old Coal Branch towns which we believe are of concern to Aboriginal Group H. Due to this concern and those expressed by other stakeholders during previous mine extension regulatory processes, CVRI has worked with the Director of Cemeteries, Alberta Culture, and its consultants to record information regarding these cemeteries and provide it to the Director of Cemeteries and AESRD to help ensure that they are not inadvertently disturbed in the future. A report on these activities is forthcoming. None of these are associated with the Project area. If during operations possible burials are encountered in the Project area, CVRI is prepared to work with Aboriginal communities and regulators to confirm burial association and devise an appropriate avoidance or mitigation strategy. The presence of human remains or burials on Project lands, whether Aboriginal or not, is subject to Federal and Provincial laws and regulations including Section 182 of the Criminal Code, the Alberta Cemeteries Act, and potentially the Alberta Historical Resources Act. Knowingly disturbing human remains (improper interference) without legal authorization constitutes a criminal act, and knowingly disturbing burials, recorded or not, without legal authorization contravenes the Cemeteries Act and potentially the Historical Resources Act. In addition to moral duties, sanctions of both a criminal and financial nature for any actions provide significant impetus for CVRI to act swiftly and accordingly should potential burials be identified during development activities. Mine management will ensure that all supervisors and workers are aware of the legal and moral issues regarding possible burials.
10	Potential Impact to Treaty or Aboriginal Right	Traditional Use	general impacts to environmental quality in Project area	[Individual] stated that "we want to work with the company to mitigate issues, its an ecologically special place"	November 10, 2009	CVRI will continue the consultation with the Aboriginal groups as information is brought forward regarding specific impacts to traditional uses as well as undertake further discussions with Aboriginal groups on specific impacts and mitigation measures. CVRI is also committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. The development of the Project, particularly the development of the mine pits, soil and rock stockpiles, dumps, and roads, will definitely impact plants and animals in the disturbance zones. Through the mitigative measures proposed in the Project Application and discussed in this table, CVRI will limit those heaviest impacts to the disturbance zones, and minimize or eliminate any potential effects in adjacent or downstream areas. Through the reclamation activities also discussed, CVRI will return the land in the impact zones to a more productive state in the future. CVRI will complete longer-term monitoring on the impact to medicinal and other plants and for general environmental monitoring, and continue to consult with the Aboriginal communities regarding future development plans. CVRI will ensure that environmental factors and protection measures are taken into consideration during all phases, from planning to reclamation, of mine development. Technically proven and economically feasible measures will be taken which protect environmental quality for air, water, vegetation, wildlife and land resources. CVRI undertakes as a priority "pollution prevention" in preference to "pollution cleanup". Pollution prevention measures in place at CVRI include: <ul style="list-style-type: none"> <li>• reuse and recycling of products;</li> <li>• substitution of products purchased with more "environmentally friendly" materials;</li> <li>• equipment modifications and improved operating efficiencies; and</li> <li>• conservation of materials and resources.</li> </ul> CVRI is an active participant in many environmental and regulatory initiatives and will continue to be an active member of these programs during the operating life of the Project. Programs range from participation in regional programs such as the West Central Airshed Society (WCAS) and West Fraser's Forest Resources Advisory Group (FRAG), to provincial and national initiatives. The purpose of the Environmental Protection Program at the CVM is to first prevent and second to minimize adverse environmental impacts resulting from mine related operations. The program will be implemented in the Project area through the following on-site mechanisms: <ul style="list-style-type: none"> <li>• adaptive management approach to environmental risk assessment;</li> <li>• Safety, Health and Environment Committee (SHE) comprised of key CVRI employees;</li> <li>• emergency response and wildfire control and prevention;</li> <li>• waste management program;</li> <li>• spill response and clean up procedures;</li> <li>• operating policy commitments; and</li> <li>• site reclamation.</li> </ul>

H	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
11	Potential Impact to Treaty or Aboriginal Rights	Health	general impacts to animal health quality in surrounding region	Community member stated "If there are too many animals there, then we as public will have to pay for disease problems."	October 23, 2008	<p>One of the concerns being expressed here is about the high ungulate populations currently making use of older reclaimed areas at CVM, and the lack of access to hunt there, one method used to manage populations. Please see response #3 above regarding access to reclaimed areas.</p> <p>Through its consultation efforts, CVRI is aware that many Aboriginal groups are concerned about the effect of industrial development on wildlife health. They report cases of diseased animals that when butchered are found unfit for consumption, and many attribute this to industrial development. This has even led to research studies into animal health supported by several Treaty 6 First Nations. And of course, Alberta Fish &amp; Wildlife (AESRD) studies numerous animal health issues including Chronic Wasting Disease (CWD), White-nose Syndrome, West Nile Virus, mammalian skin tumours, and numerous others. They have established programs to track, understand, and manage many of these. CVRI recommends that Aboriginal groups continue to press the Provincial Crown and other industrial players on the potential link between industrial activities and animal health. As for Robb Trend Project potential effects on animal health, a discussion of these is found in CR#5, Human Health, Appendix F: Screening Level Wildlife Risk Assessment (SLWRA). This assessment looked at a potentially harmful substances that could be associated with the Project such as air contaminants, heavy metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and others that could be released into the air, or otherwise make their way into soils or surface water, and then be breathed in or eaten by animals. In order to err on the side of caution, the study assumed that potentially affected animals would be exposed to maximum potential adverse effects from the air for their entire life cycle, and that the Project would last 80 years instead of 25. The assessment concluded that predicted acute exposures to the substances through the air would not have an adverse effect on either avian or mammalian wildlife in the region. It was also concluded that predicted chronic exposures to the substances through the air would not have an adverse effect on mammalian wildlife in the region. Most predicted soil concentrations for these substances are not expected to have an adverse effect on wildlife populations in the study area. However, some metals identified during the screening indicated a possible concern under only one of the several screening guidelines, and resulted in more in-depth analysis. This analysis indicated that these metals will be within the typical range of levels across Alberta, and therefore comparison of predicted soil concentrations to background levels indicated that wildlife are not likely to be at any greater risk in the RSA than other populations across Canada. In all instances, the long-term surface water concentrations of the substances are not anticipated to adversely affect wildlife populations in the region. The results of the SLWRA indicate that the overall risks posed to wildlife health from the Project will be low. Therefore, no impacts to wildlife populations are expected based on estimated wildlife exposures to predicted maximum acute and chronic air concentrations and measured soil and surface water concentrations. The confidence in the prediction is high since highly conservative assumptions were applied in the SLWRA. CVRI will continue to work with government agencies, Aboriginal groups, and others to monitor and mitigate against potential effects to animal health in the region.</p>
12	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general effect on environmental quality in surrounding region	[Leader] inquired how far outside the project areas would be impacted	October 1, 2009	The Project area will not all be disturbed at one time. Within the permit area CVRI will apply for specific mine licenses covering 5 to 10 year mine blocks. These disturbances will be limited to the footprint that will be identified and this footprint must be contained within the permit boundary. Watercourse that flow through the Project have the potential to affect surrounding regional water quantity and quality. Downstream flows will be managed to adhere to instream flow guidelines (AENV 2011). In general, peak flows will be reduced and low flows will be increased. This attenuating effect may have some impact on fish habitat composition and could also benefit fish populations by reducing the intensity of high flow events that can adversely affect fish, particularly during the early life stages. No significant water quality changes are expected and water quality in the end pit lakes will likely be suitable for aquatic life.
13	Potential Impact to Aboriginal Heritage	Historical Resources	requests for information on location and nature of recorded Historical Resources in the Project area	<p>Member inquired about historical resources and the protection thereof.</p> <p>[Individual] stated that the [Aboriginal Group] are usually concerned with the loss of the historic part of these communities</p> <p>[Individual] stated "We want to work with the company to mitigate issues, its an ecologically significant place, [Leader] grew up in the Coal Branch and so did my mother."</p> <p>[Individual] inquired if there were townsites in the area and expressed concern that things will not be the same, some thing would be nice so next generation can see history in Alberta</p> <p>[Individual] requested a historically detailed map of the area</p>	<p>October 23, 2008</p> <p>October 1, 2009</p> <p>November 10, 2009</p> <p>October 2, 2011</p> <p>December 7, 2012</p>	<p>CVRI's consultants undertook a detailed Historical Resources Impact Assessment of the Robb Trend Project area. None of the old Coal Branch towns is located within the currently proposed Project area or its likely disturbance limits, although heavily disturbed industrial remains associated with some of the actual historic mining operations are found in some areas. The development of the mine will remove some of these industrial workings, including the old underground workings. As with its previously proposed mining extensions, CVRI has worked closely with its consultants and the Historical Resources Management Branch to either avoid significant historical resources or to mitigate the impacts to them prior to development. Prior to disturbance, CVRI will be required to mitigate some sites in its proposed disturbance area through additional recording, mapping, photography, artifact collection, and excavation. Over the years, particularly in the distant past, mining and other types of development have had negative impacts on old Coal Branch towns, but the management system in place today ensures that important information is gathered regarding significant sites prior to any unavoidable impacts. CVRI has contributed to the development of knowledge regarding some of these areas, particularly some of the earliest Coal Branch towns that few, if any, have any living memory of. The management of all historical resources in Alberta is governed by the Historical Resources Act and administered by the Provincial Crown (Alberta Culture). Provincial authority to do so has been supported by past Supreme Court of Canada decisions, most notably Kitkatla Band v. British Columbia (2002 SCC 31). Although CVRI has shared some general information regarding its Historical Resources Impact Assessment studies with both Aboriginal groups and the public, regulations under the Act limit information sharing on the part of CVRI and its consultants in order to help protect extant significant sites and any associated information and artifacts. Any questions regarding historical resources should be directed to the Head, Archaeological Survey of Alberta, Historical Resources Management Branch, Alberta Culture.</p>
14	Consultation	Consultation	Consultation	<p>[Individual] inquired if CVRI would work with them on doing an open house</p> <p>[Individual] expressed interest in TUS studies and noted that they have a formalized TUS process</p> <p>[Individual] expressed that the [Aboriginal Group] would like to work on a TLU study in multiple phases and surrounding the project area</p> <p>[Individual] suggested a TLU study be done with revisiting and reviewing a proposal</p> <p>Discussion and interest in TLU studies and how scope and scale of how it could be done</p> <p>[Individual] emailed a response to the October 9 letter from CEAA on behalf of [Leader]. [Individual] agreed with the outline of issues and discussions posed in the letter, and indicated that one outstanding item was a verbal commitment from Coal Valley to undertake a traditional use study which has not occurred.</p> <p>[Individual] expressed that if info becomes public, medicines wont work so some elders are very secretive about traditional knowledge</p> <p>[Individual] expressed interest in CVRI helping with a mailout to all [Aboriginal Group] locals to give their feedback on the project and make sure all locals have a chance to provide concerns</p> <p>[Individual] expressed they would like two local meetings to ensure [Aboriginal Group] involvement 1. Hinton 2. Marlboro/Edson</p> <p>[Individual] stated "Marlboro and Edson communities I'm more concerned about, you've talked to Hinton, more traditional in Marlboro not as often consulted"</p> <p>[Individual] suggested hosting community meetings (Hinton, Edson, Marlboro) as there are still some traditional people there who might have input on project</p> <p>[Individual] stated "our job is to help local communities engage, locals are corporate structure, we need to make sure all local people are involved, that was our concern with you talking to locals, Marlboro has two big groups which don't always represent each other, we need to access and benefit locals, not me."</p> <p>Interest expressed and support of a joint Open House for community members to attend</p> <p>Two communities and specific members expressed more information on the project after mailout</p>	<p>October 1, 2009</p> <p>October 1, 2009</p> <p>November 10, 2009</p> <p>February 23, 2011</p> <p>December 6, 2012</p> <p>October 30, 2012</p> <p>October 2, 2011</p> <p>November 10, 2009</p> <p>November 10, 2009</p> <p>February 23, 2011</p> <p>February 23, 2011</p> <p>February 23, 2011</p> <p>February 23, 2011</p> <p>February 23, 2011</p> <p>December 6, 2012</p>	<p>Through meetings with Aboriginal Group H leadership, meetings or open houses in Hinton, Robb, and Edson, and surveys sent to Aboriginal Group H membership, community members have had the opportunity to express their views on the Project and communicate any concerns to Aboriginal Group H leadership or to CVRI directly. The results of a mail out to community members in 2011 did not support the idea that additional community-specific open houses are needed. Although concerns have been expressed by leadership regarding general issues of environmental impact, protection, and stewardship, potential impacts to hunters and medicinal plant gatherers, and issues relating to employment and contracting opportunities, no site-specific concerns related directly to the Project and its potential effects on Rights and traditional uses has been raised by Aboriginal Group H membership. Membership has inquired about further information, specifically related to potential employment opportunities. As Aboriginal Group H leadership indicated in correspondence with CEAA on October 30, 2012, the remaining outstanding issue concerning them was the possible implementation of a traditional use study associated with their membership. CVRI has engaged in discussions with Aboriginal Group H membership regarding the potential scope and scale of such a study. CVRI is currently awaiting a proposal and cost estimate from Aboriginal Group H on a proposed traditional use study.</p>

H	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
15	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	[Representatives] inquired about job opportunities	October 23, 2008	CVRI has a hiring policy open to anyone with suitable qualifications. This policy has been provided to Aboriginal groups. CVRI has offered to communicate job posting with Aboriginal employment officers.
				Community member inquired information based on CVM newsletter about the project, employment opportunities, and open houses etc.	September 1, 2011	
				Community member made comment as to having more [Aboriginal Group] involvement in the project (environmental monitoring, reclamation, contracting)	October 23, 2008	
				[Individual] expressed that the [Aboriginal Group] are looking for job opportunities and [Individual] expressed that "permanent jobs are especially hard to find."	November 10, 2009	
				[Individual] expressed that her role was to ensure that [Aboriginal Group]/Aboriginal people get good jobs and have this interest	February 23, 2011	
				Interest was expressed for job opportunities and [Individual] state she would like to encourage people	October 4, 2011	
16	Education Support	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	[Individual] inquired if CVRI would hire high schoolers for summer opportunities	October 23, 2008	CVRI has a hiring policy open to anyone with suitable qualifications. This policy has been provided to Aboriginal groups. CVRI has offered to communicate job posting with Aboriginal employment officers.
17	Contracting Opportunities	Socio-economic development	development of Aboriginal owned business; increased employment for underemployed sector of Aboriginal society	[Individual] expressed that the [Aboriginal Group] are interested in economic opportunities and would like to develop this as part of a relationship with CVRI	October 1, 2009	CVRI has a procurement policy open to any business which provides competitive services. This policy has been provided to Aboriginal groups. CVRI has offered to receive and review available Aboriginal business proposals.
				Interest was expressed in contracting opportunities and [Individual] stated that their are [Aboriginal Group] companies qualified to be involved in reclamation work	October 1, 2009	
				Interest was expressed for business and contracting opportunities	November 10, 2009	
				[Individual] expressed that they would like to identify possibilities for opportunities for contractors and might need capacity development to develop	February 23, 2011	
				[Individual] inquired of a list of contractor criteria from CVRI	February 23, 2011	
18	Cultural Program Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	[Individual] stated that it would be good to set up meeting in Marlboro and support their community initiatives	November 10, 2009	Through meetings with Aboriginal Group H leadership, meetings or open houses in Hinton, Robb, and Edson, and surveys sent to Aboriginal Group H membership, community members have had the opportunity to express their views on the Project and communicate any concerns to Aboriginal Group H leadership or to CVRI directly. CVRI worked with Aboriginal Group H leadership on a mailout in 2011 to membership seeking input, and specifically to help gauge interest in an open house or other meeting specifically aimed at this community. To CVRI's knowledge, responses to the survey did not indicate a desire for such a meeting in the community. CVRI concludes that its efforts to disseminate information about the Project and to collect concerns from the Aboriginal Group H membership have been successful. CVRI has not been made aware of any Marlboro community initiatives for which assistance from CVRI is requested, but as with other Aboriginal groups, it is prepared to entertain such requests for assistance.
19	Long-term Agreements	MOU	-	[Individual] stated that she would be interested in an MOU with CVRI	October 1, 2009	The CVRI consultation relationship with Aboriginal Group H will remain active through the life of the project to continue information sharing and adaptive management of future concerns.
				[Individual] expressed that the [Aboriginal Group] wanted to negotiate and work on an MOU	November 10, 2009	

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	General Traditional Use	General Traditional Use	It was stated that from the maps provided by Les LaFleur in the package that was sent to the First Nation, there appears that there may be some overlapping interests for trapping, hunting and fishing.	September 19, 2006	CVRI has engaged in consultation with Aboriginal Group I since 2006 on its proposed developments including the Robb Trend Project, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Through a series of meetings with Chief and Council and its representatives, field trips to project areas with elders, an open house in the community, and traditional use studies of the Project area, CVRI has gathered general input such as noted here about overall concerns regarding potential Project impacts to Treaty Rights and traditional uses of the area and potential environmental impacts. The results of the traditional use studies reported sites of importance in the general region, such as the Sundance and campsite areas referred to, but none within the Project area. CVRI offered to assist in an additional field visit to identify some of the salt-licks to which the Chief referred, that appear to be located north of the Project area, but these visits were never arranged. As discussed in some of the responses below and on other Aboriginal concern response tables, and as detailed in the Environmental Assessment, CVRI has a number of strategies in place to mitigate any Project effects on wildlife and the environment. To date, no Aboriginal Group has demonstrated that the development of the Project will have a particularly deleterious, non-mitigable effect on Rights to hunt, fish, and trap for food. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Rights and undertake traditional activities will not be curtailed in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group I, to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Rights and traditional uses during the development of the Project. The purpose of discussions with individual Aboriginal groups is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, and that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, but that those restrictions will not be permanent. Consultation efforts with Aboriginal Group I resulted in a letter from Aboriginal Group I dated November 18, 2009 in which it indicates that consultation has been adequate, it has no further concerns, and provides endorsement is provided for the proposed CVRI projects, including the Robb Trend.
				Concern raised by two elders during field studies and recorded in TUS report "All these rivers and hills have sacred purposes and I hope those are not lost in cutting up this land to make money.", elder two: "These ceremonies are conducted at sites where sacred medicines will be devastated and forested areas will be removed, altering the natural effects of the diverse and delicate balance of nature that exists in such areas"	2007	
				Hunting areas identified and waypoint recorded in 2007 TUS report: "Hunting and trapping area used by First Nations people, including the [Aboriginal Group] First Nation" and "Pembina campground used by First Nations campsite along the river."	2007	
				It was noted that near project area are moose-licks and the Chief stated that he hunts moose in this area. [Individual] also noted that hunting problems are very important to [Aboriginal Group]. Chief noted this is a serious problem for them in terms of the environment, lakes and impact on hunting and hunting grounds.	September 30, 2011	
2	Potential Impact to Treaty or Aboriginal Rights	Hunting	direct impact/removal of hunting locations in Project area	Chief stated that elders had seen the area and have said that there is lots of moose there and that it is a good hunting area.	September 30, 2011	The development of the Project, particularly the development of the mine pits, soil and rock stockpiles, dumps, and roads, will definitely impact plants and animals in the disturbance zones through displacement. This would have a potential impact on the generalized right to hunt, fish, and trap in these areas during mine development. Most wildlife will likely be displaced to adjacent habitat patches. Ungulates will be temporarily displaced by active mining as they are unable to cross a pit disturbance. This displacement will be restricted to local use as there are no indications of long distance or major seasons migrations in the LSA. Large amounts of moderate quality moose habitat is available throughout the RSA for moose thereby moderating the effect of habitat change caused by mining. High quality moose habitat on the Project and other areas associated with mixed wood of the Lovett Ridge will be reclaimed with a closed forest regeneration forest of lesser habitat quality. The impacts of the Project development on moose in the region can be mitigated by: implementing reclamation techniques appropriate for moose, establishing a variety of vegetation types and promoting understory complexity in regenerated forests that includes willow species, aligning reclamation and other re-vegetation efforts to maintain and improve moose habitat, taking steps to ensure core security areas are provided for wildlife, implementing appropriate monitoring, cooperating with the province and other industry on access management and other relevant management issues. An examination of elk observations during Fish and Wildlife moose surveys in the area on the north side of the existing CEA study area indicates scattered elk in low numbers. There is not a substantive elk population in this area. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. It is expected that elk and deer will respond positively to the early stages of upland reclaimed and re-vegetated areas on the LSA particularly in the Robb West, Main and Central zones where there is extensive mixed wood and deciduous habitat adjacent the disturbance area. The impact of mining development will involve direct mortality through clearing and loss of habitat during mine development and changed composition in small mammal communities in the early stage of reclamation. Small mammals such as rabbits will be temporarily displaced by active mining as they are unable to cross a pit disturbance. Other forest dependent small mammals (red squirrel, snowshoe hare) will be expected to use the regenerated forest and its understory once it becomes established. Understorey development is a necessary component of snowshoe hare habitat. The density of small mammals in reclaimed grasslands has been shown to be similar to undisturbed habitats (Hingten and Clark 1984). After initial grassland establishment, the number of small mammal species is expected to be similar to those on undisturbed similar habitats. CVRI acknowledges that active mining in the Project area will have a direct impact on wildlife, including birds and amphibians, through short to medium-term removal of habitat, fragmentation of habitat, barriers to movement, and possibly direct mortality in some cases (e.g. vehicle collisions etc.). CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features. CR#14 and CR#7 of the Project application detail the proposed mitigation of these effects through the identification of wildlife as a primary end use of the lands, the maintenance of as much undisturbed habitat as possible in the Project area, the revegetation of soil stockpiles to maintain wildlife use, vegetation clearing outside of breeding seasons, buffers along riparian zones, contouring to reduce lines of sight, identification of natural seepages that will become salt/mineral licks after reclamation, hunting restrictions, measures to avoid direct mortality, and a reclamation program that will promote the structural integrity and biodiversity of the landscape to enhance future wildlife use. CVRI has committed to the use of Aboriginal traditional ecological knowledge to assist in land reclamation activities to achieve these goals. The studies conclude that when recommended mitigation and monitoring occur, appropriate biodiversity will re-establish in disturbed areas in the medium to long-term (25 to 50 years), and have no cumulative effect on the region.
			impact to hunting in Project area	In letter stated concern that has not been addressed: "Traditional food source loss: [Aboriginal Group] First Nation's main staple is moose meat, rabbits, deer, etc. and their habitat in the project area no longer exists."	February 13, 2013	
			displacement of game animals from Project area	Concern raised during meeting where [Individual] noted that traffic and noise pollution are causing problems for hunting grounds.	September 30, 2011	
			direct impact/removal of salt/mineral licks (important to game animals) in Project area	Concern raised during meeting where it was noted that near the project area is moose-licks and the Chief hunts moose in this area. It was also noted that the Pembina River Campground (used by [Aboriginal Group]) has limited moose-licks. [Individual] and Chief suggested that they want the elders to go out and mark these moose-licks as they are concerned of ensuring protection.	September 30, 2011	
3	Potential Impact to Treaty or Aboriginal Rights	Trapping	general trapping concern	One individual at the open house expressed concern of secondary effects regarding the Robb Trend. They believe that the opening of that area would result in the mining of the same coal seam all the way to all the way to the east, through [Aboriginal Group] traplines to the east (outside the proposed permit area) in the Elk River area, and eventually all the way to the east to the reserve.	November 8, 2006	The Project development is planned for the west side of the Pembina River. At this time no disturbance will occur to the east of the river. A total of 22 Registered Fur Management Areas (RFMAs) overlap in whole or in part with the RSA. Fur harvest return information for the period 1985 to 2001 was obtained from Alberta Sustainable Resource Development for the RFMA. Fur returns for 17 different species were reported. This included red squirrel (13,348), muskrat (3,649), beaver (3,401), marten (1,796), weasel spp. (1,531), coyote (896), wolf (236), lynx (133), mink (128), fisher (50), red fox (47), black bear (18), badger (14), striped-skunk (7), wolverine (6), river otter (4) and raccoon (1). The average numbers of captures per year per trap line for Valued Environmental Component (VEC) species were: lynx (0.42), marten (5.17), fisher (0.16), and wolf (0.71). RFMAs 1516, 2619 and 2256 will be directly affected by the proposed development of the Project permit area. Over a 16 year period, RFMA 1516 reported an average number of lynx (0.4/year), fisher (0.19), marten (5.4/year) captures and reported below average wolf captures (0/year). Over a 15 year period, RFMA 2256 reported above average marten (8.5/year), and fisher (0.13) captures and below average lynx (0.3/year) and wolf (0.1/year) captures. Over a 17 year period, RFMA 2619 reported below average capture rates for lynx (0.2/year), marten (1.2), fisher (0.12), and wolf (0.6). Caution must be used when interpreting this data. Capture rates can vary widely and may reflect trapper effort and fur prices as much as it does of animal abundance. Capture rates can also reflect the size of the RFMA. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Contact and discussions have been held with people holding Registered Fur Management Area rights. Where required, agreements have been reached and compensation provided. Trapping is likely to continue in the RSA. Harvest levels are difficult to predict and are dependant largely on fur prices, RFMA tenure and levels of industrial activity. It is reasonable to assume that future trapping levels will occur at average levels from 1985 to 2001. As noted above, Project development will occur over time, and access to mine areas to undertake Treaty Rights to trap will be curtailed in active mining areas for a period of time. However, areas surrounding the Project will still be available to undertake Treaty trapping rights, and Project development and reclamation will be complete by 2060, returning those lands for trapping uses.
				Trapping concerns raised by [representatives]	December 3, 2012	

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
4	Potential Impact to Treaty or Aboriginal Rights	Fishing	removal of fish resources/habitat in Project area	Fishing concerns raised by [representatives]	December 3, 2012	<p>As previously indicated, access to the Project area to undertake Treaty fishing rights will be curtailed during development, but that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be curtailed in the entire area upon Project approval and it will not be permanent. The Project is expected to have no effect on fish in the surrounding area, which will remain available for undertaking Treaty fishing rights. Activities associated with the Project that have potential to directly impact fish habitat and, consequently, fish populations will not extend into the RSA. The impacts to fish populations as a result of the mining and pit filling is expected to be minimal since it is assumed that downstream flows will be managed to adhere to instream flow guidelines (AENV 2011). In general, peak flows will be reduced and low flows will be increased. This attenuating effect may have some impact on fish habitat composition and could also benefit fish populations by reducing the intensity of high flow events that can adversely affect fish, particularly during the early life stages. Potential changes in surface water quality in the RSA were assessed as insignificant (Section E.11, CR# 11) and are not expected to significantly impact fish populations in the RSA. No additional access to water bodies in the RSA is expected to occur as a result of the Project. Measures to reduce or mitigate potential effects were identified using proven strategies and combined expertise of professionals. Potential local effects on the fisheries Valuable Environmental Component's (VEC) associated with direct habitat loss or alteration are expected to be fully mitigated with properly implemented mitigation strategies. No significant water quality changes are expected and water quality in the end pit lakes will likely be suitable for aquatic life. CR #2 (Section 5.4) of the Project application provides details of the numerous mitigation strategies proposed to protect fish resources, in the areas of surface water management and erosion control, haulroad crossing construction, stream diversions, management of stream flows, public access restrictions, and habitat enhancement. Therefore, no cumulative effects on fisheries VECs associated with direct habitat loss or alteration are expected. Potential adverse effects relate primarily to direct physical habitat alteration/loss, changes in surface water hydrology and water quality issues. With mitigation there will be an insignificant impact on the fisheries VEC's. CVRI is currently working with the Department of Fisheries and Oceans Canada (DFO) in creating a conceptual compensation plan to be able to uphold the principle of 'No Net Loss' to fish habitat. This plan will be required to be approved and implemented prior to disturbance. Any operational works that require a harmful alteration, disruption and destruction (HADD) of fish habitat will require to be applied for with DFO. The compensation plan will be referred to in establishing site specific compensation related to each working (crossing, diversion).</p> <p>As stated in the application, in order to monitor the effectiveness of the planned mitigation measures, CVRI will:</p> <ul style="list-style-type: none"> <li>• monitor flows and TSS at all settling ponds;</li> <li>• conduct regular inspections of all drainage works;</li> <li>• expand the existing CVM aquatics monitoring program to include additional benthic macroinvertebrate sample sites;</li> <li>• implement a water quality monitoring program for the life of the Project designed to meet the requirements of the Project approval;</li> <li>• conduct long term monitoring of flow in each main creek to document critical low flow conditions during pit filling periods and to define the need for any bypass pumping to maintain in-stream flows;</li> <li>• monitor components of the compensation plan, (i.e., fish habitat enhancement structures) post-construction to assess the effectiveness of the compensation and to identify modifications that will be made (if necessary);</li> <li>• evaluate end pit lakes to assess fish use, biological productivity, water quality, and other physical properties (i.e. thermal regime);</li> <li>• implement TSS/turbidity monitoring during instream work if deemed necessary due to site conditions or timing of works; and</li> <li>• monitor downstream flows to ensure instream flow needs are met.</li> </ul> <p>This monitoring information will be publicly available within the CVRI – CVM Annual Report that is submitted to ESRD.</p>
5	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of medicinal plant species in Project area	Area addressed by elder and recorded waypoint in 2007 TUS report, the elder stated that they "conducted a ceremony near the site. These ceremonies are conducted at sites where sacred medicines will be devastated and forested areas will be removed..."	2007	CVRI acknowledges that the development of the Project will disturb a large area through direct impact, and remove many of the useable resources present. However, as described in response #1 the effects of the Project will not be permanent, and CVRI will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group I, to return the land to a more natural, useable state once mining activities have ceased. Representatives of Aboriginal Group I held another ceremony near the Project area on June 6, 2007 with invited representatives of CVRI to ask the Creator's forgiveness for the destruction associated with the Project. Aboriginal Group I produced a letter dated November 18, 2009 in which it indicates that consultation has been adequate, it has no further concerns, and provides endorsement for the proposed CVRI projects, including the Robb Trend.
6	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	reclamation	<p>Major concern voiced by several participants during the Field Tour was the fact that in the reclaimed areas, with the exception of trees, grass and moss, the other important plants did not seem to be re-appearing.</p> <p>Concern voiced by elder during the Open House that having visited the Coal Valley area and having seen the reclamation, she did have concerns that once mining was finished, the land would be restored, but she did not feel that everything that was there before would return.</p> <p>Letter to Lori stated "During the initial consultation with [Individual] and elders with CVRI, the proponent conducted a field visit to the reclaimed land site. [Aboriginal Group] members ([Individual] and the elders) were NOT satisfied with the reclaimed site. The natural traditional medicinal plants were not present, the land was very artificial and could not be used to practice [Aboriginal Group]'s Aboriginal Treaty 6 rights."</p> <p>Item raised by [Individual] Jan.19, 2007 that [Aboriginal Group] would like to be involved in reclamation issues and make sure everything will be done to standards of the Environmental Enhancement and Protection Act.</p> <p>Item raised by [Individual] during April 30, 2008 meeting "We want to be involved in reclamation".</p> <p>Reclamation interest discussed and raised by Chief and Council as well as interest in reclamation contracting opportunities</p> <p>[Individual] stated "reclamation industry is here, we want to participate in that, there has been total neglect"</p>	<p>October 22, 2006</p> <p>November 8, 2006</p> <p>February 13, 2013</p> <p>January 19, 2007</p> <p>April 30, 2008</p> <p>April 10, 2012</p> <p>July 23, 2012</p>	<p>The reclaimed mine area visited by the Elders in 2006 consisted of an end-pit lake and surrounding area that had been reclaimed and planted with trees, but that was at an early stage of regeneration. Contrary to some of the negative statements included here, and the overall rejection stated in a letter of February 13, 2013, the overall reaction was in fact a positive, hopeful one. Some of the elders did remark that many plants they hoped to see were not there, but other native plants were observed returning, and there seemed to be general satisfaction that the reclamation was moving in the right direction. Reclamation is not an event, but rather a process. It will certainly take another 50 years of forest regrowth in that area to provide a suitable habitat to support many of the plant species currently not observable there. However, CVRI is confident that these lands will return properly with the resources there previously and in the region suitable for the exercise of Treaty Rights to hunt, fish, and trap for food. This can in fact be seen at the old historic mining operations in the area, that witnessed no reclamation activities at their surface disturbances, and yet which many people pass through today unaware that they are walking through areas totally cleared of vegetation one hundred years ago. Although reclaimed areas such as that visited have not yet returned to a state suitable for the undertaking of all traditional activities that may have been practiced in the area, the reclamation efforts will see future generations able to undertake traditional activities as the important plants and animals return. The revegetation program proposed for the Project area will use experiences gained over the years at the CVM. Vegetation species will be selected to match site-specific conditions (slope position and exposure) that are consistent with the land use objectives; watershed, timber, wildlife, fisheries and aesthetics/recreation.</p> <p>Three seed mixes are currently being utilized at CVM; the standard mix was formulated for use in drier upland areas, the wetland mix is formulated for the revegetation of lower lying wetter sites and constructed wetlands and a native seed mix formulated to facilitate native succession. Traditional value plants will be identified in respect to their possible use as revegetation species. The revegetation program will plant the dominant tree species; either a conifer or deciduous species. Where reclamation stock is available suitable understory species will be inter-planted with the tree seedlings. Initial grass/legume seeding will be undertaken during the first growing season following minesoil placement. Fertilizing will be completed in the same year (and may be repeated once more on some sites within the next five years). Planting or seeding of native herbaceous stock and planting of woody species (shrubs and trees) will be completed by the fourth growing season following coversoil replacement. Woody species planting will only be done when the ground cover has become fully established and has progressed beyond the initial heavy growth phase. Vegetation on the reclaimed landscape will continue to change after the reclamation activities have been completed. Some of the species in the initial seed mix will not persist, allowing other native species to ingress. Many native species will establish from roots or seed in the replaced soil, and other species will ingress from surrounding areas.</p> <p>One of the most common concerns among Aboriginal elders was the impact to medicinal and food plants in the Project area (refer to Table E.12-1 and E.12-2; CR #12, Appendix B and D to G). A number of these plants are believed to be "rare" or "rare elsewhere," whereas others are more common. Often these plants cannot be transplanted due to specific conditions required. Transplanting may, in some cases, impact the potency or efficacy of the medicines. CVRI was asked to use traditional knowledge and native plant species in the reclamation process and will do so. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions. These ecosites will be targeted in the reclamation process in order to provide the traditional knowledge and native plant species an environment suitable for survival. CVRI will continue the consultation with the Aboriginal groups as information is brought forward regarding specific impacts to traditional uses as well as undertake further discussions with Aboriginal groups on specific impacts and mitigation measures. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation.</p>

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
7	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	Environmental monitoring	Item raised by [Individual] during April 30, 2008 meeting stating that monitoring system is needed and that "people come from as far as New Mexico to pick plants."	April 30, 2008	<p>CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecosite phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecosite phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecosite phases which support TEK vegetation will be accessible in the RSA following removal of ecosite phases by the Project Footprint in the LSA. It is assumed that ecosite phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:</p> <ul style="list-style-type: none"> <li>• inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application;</li> <li>• working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and,</li> <li>• implementing a re-vegetation program which aims at the re-establishment of ecosites common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecosites will, over time, again support TEK vegetation.</li> </ul> <p>With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecosite phases within the LSA. CVRI is committed on working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established.</p> <p>The following monitoring will continue within the Project area and throughout the mine site to ensure the continued stewardship of the environment:</p> <ul style="list-style-type: none"> <li>• groundwater;</li> <li>• surface water;</li> <li>• air;</li> <li>• noise;</li> <li>• wildlife/aquatics;</li> <li>• vegetation/wetlands;</li> <li>• reclamation; and</li> <li>• regulatory compliance.</li> </ul>
8	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of ceremonial locations in Project area	Area addressed by elder and recorded waypoint in 2007 TUS report: "This is a cultural area, dating back in my experience, at least 4 generations. where sundance and spiritual ceremonies were practiced, still today".	2007	The site recorded and discussed in the traditional use report is a Sundance location and associated camping areas and other types of sites used by a number of Aboriginal groups in the region. It is well-known to CVRI and other industrial proponents in the region, and to recreational users of the area. There have been several instances in the past of cabins or ceremonial structures being burned or otherwise vandalized by unknown parties. This location is of concern to several Aboriginal groups, and probably to other non-Aboriginal recreational users. However, this area is located well outside of the proposed Robb Trend Project area, and will see no impact from its development.
9	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	direct impact/removal of other cultural sites (cabins, camps, gathering, teaching) in Project area	Area recorded with waypoint in 2007 TUS report and stated by elder: "Present day camp area, used by weekend hunting expeditions and cultural camps."	2007	The site recorded and discussed in the traditional use report is a Sundance location and associated camping areas and other types of sites used by a number of Aboriginal groups in the region. It is well-known to CVRI and other industrial proponents in the region, and to recreational users of the area. There have been several instances in the past of cabins or ceremonial structures being burned or otherwise vandalized by unknown parties. This location is of concern to several Aboriginal groups, and probably to other non-Aboriginal recreational users. However, this area is located well outside of the proposed Robb Trend Project area, and will see no impact from its development.
				Concern of impact raised during meeting where [Individual] noted that he would like monitoring at the Pembina River Campground (used by [Aboriginal Group]) as there is limited cabins and moose-licks and a ceremonial site was burned down there.	September 30, 2011	

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
10	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to water quality in Project area	<p>Concern raised by [representatives], concern raised in Feb. 13, 2013 letter to Lori Crozier (CEAA) as lift of items that have not been addressed "Information in regards to a Water study. What chemicals are being used in washing coal? Where is the water source? What are the volumes used and when? Will the water be introduced back into the environment and where? What chemicals if any, will be in the water at that time?"</p>	December 3, 2012	<p>CVRI has developed a Water Management Plan to contain all mine affected water. These mine affected waters are directed to impoundments where they are treated with an approved flocculant. Prior to release into the receiving watercourse all water must meet the Approval water quality guidelines. In an event of a registered storm event some short term exceedances are allowed (TSS). Surface water quality could be impacted by issues including: 1) soil erosion, sediments entering streams via surface runoff, increased sedimentation of surface waters; 2) leaching of nitrates into surface waters; 3) discharges of water from impoundments to natural watercourses; and effects on end-pit lakes on surface water quality. The general practice at the CVM is to discharge groundwater entering the Project mine areas to nearby surface water courses after being treated in settling ponds. It has been shown that the quality of groundwater in the two proposed mining areas are similar to groundwater chemistry in present and past mining areas in Coal Valley and of acceptable quality for discharge to surface water bodies. There will be an insignificant impact on surface water quality caused by the discharge of groundwater from the pits. There are two issues with respect to how changes in groundwater chemistry may affect the quality of groundwater in the vicinity of the Project pits. These issues can be summarized as 1) changes resulting from the removal and placement of mine spoil, and 2) changes due to spills and leaks. Toe springs are a characteristic of spoil dumps that are external to the mine pit. Water chemistry of four springs at the toes of major mine spoil dumps in the CVM have been monitored since 2000. All parameters fall within acceptable ranges observed elsewhere in the area. The monitoring of toe springs at CVM has demonstrated that there are no significant impacts from spoil on water chemistry. Hydrocarbon fuels will be present in the Project mobile equipment, vehicles and in bulk storage. There is a potential for spills or leaks of these hydrocarbons. Spills from equipment and vehicles will be the result of accidents. In this situation, there will be rapid response and clean up. The probability that such an event could cause an impact on groundwater quality is remote. The impact is therefore insignificant. And finally, water quality studies of CVM's existing end-pit lakes provide a good indication of the overall potential of the Project to affect water quality through contamination during coal mining in the manner suggested in the stated concern. As one can see in Appendix 8 of the Project Application, these lakes cannot be considered polluted.</p>
				Water pollution concerns raised by [representatives]	December 3, 2012	<p>CVRI will monitor watercourses within the watersheds to be affected by the Project. Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including:</p> <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval. CVRI is currently working with DFO on completing a conceptual compensation plan for the entire project which identifies the watercourses that will be affected and what compensation will be required.</li> </ul>
11	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to environmental quality in Project area	<p>[Aboriginal Group] TUS report collective concern "The responsibility of the First Nations people is to ensure adequate conditions for future generations and the obligation is to honour the ancestors for safeguarding and protecting the environment and the intrinsic balance of nature."</p>	2007	<p>CVRI has engaged in consultation with Aboriginal Group I since 2006 on its proposed developments including the Robb Trend Project and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Through a series of meetings with Chief and Council and its representatives, field trips to project areas with elders, an open house in the community, and traditional use studies of the Project area, CVRI has gathered general input such as noted here about overall concerns regarding potential Project impacts to Treaty Rights and traditional uses of the area and potential environmental impacts. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Rights and undertake traditional activities will not be curtailed in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group I, to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Rights and traditional uses during the development of the Project. CVRI understands the concerns of Aboriginal Group I elders and other community members who are concerned for the future of the area and the ability of their children to engage in traditional pursuits in the future. CVRI is confident that through its proposed environmental stewardship initiatives, mitigation measures, and reclamation activities that the Project lands will be available for the exercise of Treaty Rights and traditional uses in the future. The specific types of activities to which the land can be put to use will follow patterns seen in natural forest succession gradually following the end of reclamation. Consultation efforts with Aboriginal Group I resulted in a letter from Aboriginal Group I dated November 18, 2009 in which it indicates that consultation has been adequate, it has no further concerns, and provides endorsement is provided for the proposed CVRI projects, including the Robb Trend.</p>
12	Potential Impact to Treaty or Aboriginal Rights	Health	air quality effect on health	Feb. 13, 2013 letter where concern that has not been addressed stated "Air quality: How is the coal dust being managed within the site and for the surrounding areas. There have been incidents of coal dust pollution and methyl-mercury rain by Tomahawk. How will this be mitigated for community health concerns and wildlife health?"	February 13, 2013	<p>The Project will result in atmospheric emissions from fossil fuel combustion sources, fugitive emissions from mine equipment, refurbished Plant, soil handling, coal movement and wheel entrainment. At the ROM stockpile at the Plant, dust emissions result from the unloading of raw coal dust from trucks and from wind erosion. There were also emissions related to the loading of raw coal on the grizzly. Huh? At the clean coal pile, emission sources include wind erosion and dropping the excess clean coal from the conveyor outside of the stacking tube. The rest is accumulated in two closed silos and/or is loaded directly onto the train. CVRI does implement dust suppression to mitigate for coal and road dust sources. The coal that is placed and or in the train cars has a fairly high moisture content to help in dust suppression. Train cars are not filled to levels that would be susceptible to wind erosion and if moisture content is low the coal piles can be sprayed with water to reduce wind erosion. CR #1 presents the results of air quality studies. Overall, residual air quality impacts relevant to the Project were considered to be insignificant for several reasons. Project contributions to predicted concentrations at the RSA MPOI and at local receptors were typically very small in an absolute sense. The addition of the Project did not result in exceedances of the CWS and AAQOs or odour thresholds. All Project air quality impacts are reversible and the ambient air quality is expected to revert to its original state after the Project ceases to operate.</p> <p>Studies of Human Health impact (CR#5), including Aboriginal receptors utilizing a subsistence diet in the region, indicate no substantial Project-related health risks due to exposure to, inhalation, or ingestion of chemicals, toxins, carcinogens, or harmful non-carcinogens. No adverse health effects are expected for the region. CVRI will continue to implement monitoring of air, surface water, and ground water to help mitigate any potential effects. Given the distance of Aboriginal Group I from the Project area, potential impact to a member of that community through dietary intake cannot reasonably be expected to exceed the conditions as laid out for an Aboriginal receptor in the study of human health.</p>
			coal dust	During the Open House an individual expressed concern of the health effects of coal dust. Concern that coal trains currently pass through [Aboriginal Group] and the health effects of all those people who burned coal for years of heat, etc. In their houses.	November 8, 2006	<p>Through its consultation efforts, CVRI is aware that many Aboriginal groups are concerned about the effect of industrial development on wildlife health. They report cases of diseased animals that when butchered are found unfit for consumption, and many attribute this to industrial development. This has even led to research studies into animal health supported by several Treaty 6 First Nations. And of course, Alberta Fish &amp; Wildlife (AESRD) studies numerous animal health issues including Chronic Wasting Disease (CWD), White-nose Syndrome, West Nile Virus, mammalian skin tumours, and numerous others. They have established programs to track, understand, and manage many of these. CVRI recommends that Aboriginal groups continue to press the Provincial Crown and other industrial players on the potential link between industrial activities and animal health. As for Robb Trend Project potential effects on animal health, a discussion of these is found in CR#5, Human Health, Appendix F: Screening Level Wildlife Risk Assessment (SLWRA). This assessment looked at any potentially harmful substances that could be associated with the Project such as air contaminants, heavy metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and others that could be released into the air, or otherwise make their way into soils or surface water, and then be breathed in or eaten by animals. In order to err on the side of caution, the study assumed that potentially affected animals would be exposed to maximum potential adverse effects from the air for their entire life cycle, and that the Project would last 80 years instead of 25. The assessment concluded that predicted acute exposures to the substances through the air would not have an adverse effect on either avian or mammalian wildlife in the region. It was also concluded that predicted chronic exposures to the substances through the air would not have an adverse effect on mammalian wildlife in the region. Most predicted soil concentrations for these substances are not expected to have an adverse effect on wildlife populations in the study area. However, some metals identified during the screening indicated a possible concern under only one of the several screening guidelines, and resulted in more in-depth analysis. This analysis indicated that these metals will be within the typical range of levels across Alberta, and therefore comparison of predicted soil concentrations to background levels indicated that wildlife are not likely to be at any greater risk in the RSA than other populations across Canada. In all instances, the long-term surface water concentrations of the substances are not anticipated to adversely affect wildlife populations in the region. The results of the SLWRA indicate that the overall risks posed to wildlife health from the Project will be low. Therefore, no impacts to wildlife populations are expected based on estimated wildlife exposures to predicted maximum acute and chronic air concentrations and measured soil and surface water concentrations. The confidence in the prediction is high since highly conservative assumptions were applied in the SLWRA. CVRI will continue to work with government agencies, Aboriginal groups, and others to monitor and mitigate against potential effects to animal health in the region.</p>
			general impacts to Aboriginal health quality in surrounding region	Concern raised by [representatives] including waste coal pollution, thermal pollution, sulfur dioxide, radioactivity, particulates, toxic emissions.	December 3, 2012	

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
13	Potential Impact to Treaty or Aboriginal Rights	Hunting	loss of access to additional land for hunting in general region	Impact to hunting areas addressed in [Aboriginal Group] TUS report with specific GPS coordinates of hunting locations.	2007	CVRI understands that hunters from Aboriginal Group I use the region to undertake their Treaty Right to hunt for food. However, Aboriginal Group I representatives have not reported the location of any specific hunting areas within the Robb Trend Project boundary to CVRI, nor indicated or demonstrated that the loss of any such location would have a particularly bad effect on either individual or collective rights to hunt for food. CVRI notes that courts have interpreted jurisprudence to indicate that the protection of a right does not guarantee its exercise in an "unspoiled wilderness" or in one particular location (Halfway River 1999: 140-141). CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Rights and undertake traditional activities will not be curtailed in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge, including that contributed by Aboriginal Group I, to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Rights and traditional uses during the development of the Project. During the time period of Robb Trend mining, older mine areas that have been reclaimed will be certified and returned to the Crown for general use, undoubtedly including the exercise of Treaty Rights like hunting for food. The overall cumulative effects of Crown taking up of land for other purposes as allowed under Treaty is an issue that is beyond the scope of the present consultation. Aboriginal Group I leadership needs to engage the Provincial and Federal Crowns in this regard. However, CVRI is of the opinion that the Robb Trend Project will not represent an onerous loss of land base in the region available for the exercise of Treaty Rights to hunt.
			loss of access to land available for traditional pursuits in Treaty 6 area	Loss of land concern raised by [representatives]	December 3, 2012	
				Concern raised by [representatives] of lack of proper assessment over loss from existing mine	December 3, 2012	
				Concern raised in Feb. 13, 2013 letter to Lori Crozier (CEAA) as list of items that have not been addressed "Loss of aboriginal and treaty rights within [Aboriginal Group]'s traditional territory for present and future generation. [Aboriginal Group] would like to develop mechanisms that will serve to protect areas remaining."	February 13, 2013	
14	Consultation	Consultation		Concern raised by [Individual] during meeting that TUS report was good but the community needs more.	April 14, 2011	CVRI has engaged in consultation with Aboriginal Group I since 2006 on its proposed developments including the Robb Trend Project and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. No period of "prior" or on-going consultation can be considered brief by any measure. Through a series of meetings with Chief and Council and its representatives, field trips to project areas with elders, an open house in the community, and traditional use studies of the Project area, CVRI has gathered input about overall concerns regarding potential Project impacts to Treaty Rights and traditional uses of the area and potential environmental impacts. Capacity funding for these initiatives was provided by CVRI. As can be noted in the Project Application and in bi-monthly reporting to SAAB, along the way, all relevant environmental assessment reports, regulatory documents such as Terms of Reference, and regulatory filings have been shared with Aboriginal Group I. Aboriginal Group I has been presented with many opportunities to discuss these documents and their concerns with CVRI and Crown regulatory agencies. The results of the traditional use studies reported sites of importance in the general region, such as the Sundance and campsite areas referred to, but none within the Project area. These studies, meetings, and tours raised additional concerns regarding issues of environmental stewardship, impacts, and reclamations. CVRI offered to assist in an additional field visits or tours, but these visits were never arranged. CVRI is still open to such visits and tours as part of on-going consultation efforts. Past consultation efforts spent considerable time discussing an MOU or other agreement that might encapsulate some concerns such as employment and contracting opportunities, other economic opportunities, and educational or community support in part to mitigate Aboriginal Group I concerns with the development. A decision by Aboriginal Group I consultation representatives resulted in an alternative track. Past consultation efforts with Aboriginal Group I resulted in a letter from Aboriginal Group I dated November 18, 2009 in which it indicates that consultation has been adequate, it has no further concerns, and provides endorsement for the proposed CVRI projects, including the Robb Trend Project. CVRI has continued to engage with Aboriginal Group I on the Robb Trend Project as part of the current regulatory process. In 2012, a third party entered into the consultation process on behalf of Aboriginal Group I, with the intent to pursue an Impact Benefits Agreement between Aboriginal Group I, the third party, and CVRI, similar to some claimed to be in existence in British Columbia. CVRI has never once indicated that it is unwilling to enter into such an agreement with Aboriginal Group I, past history being clear supporting evidence of this. However, CVRI has indicated to the third party and Aboriginal Group I that the draft terms and conditions set before it were far too aggressive to merit serious consideration by the proponent. In addition to going far beyond the scope of potential impact to Treaty Rights and traditional uses from the proposed Project, the proposed terms entered into territory such as revenue royalties over which CVRI has no jurisdiction. As stated, CVRI has been and still is interested in reaching a long-term written agreement with Aboriginal Group I, but stresses that the Supreme Court of Canada has ruled and the Provincial consultation guidelines indicate that the consultation process does not have to end in agreement about all issues, nor does it require a written agreement. Contrary to some of the statements made by Aboriginal Group I representatives, the purposes of any such agreements are not to provide compensation for the use of the land and past and future disturbances. To date Aboriginal Group I representatives have countered with demands that go far beyond CVRI's legal or moral responsibilities. As the scope of that agreement as requested by Aboriginal Group I goes well beyond the Robb Trend and its potential impacts to Treaty Rights and traditional uses, it may not be possible to conclude such an agreement to both parties' satisfaction prior to Project approval or development.
				[Representative] requested a subsequent mine tour	April 10, 2012	
				Concern of lack of proper consultation raised by [Individual] during July 23, 2012 meeting.	July 23, 2012	
				Jan.28, 2013 letter to Lori Crozier: "The [Aboriginal Group] had, in good faith, entered into consultation with Coal Valley and had no completed consultation....however, Coal Valley has chosen to rely upon a brief period of prior consultation as sufficient to satisfy the requirement of consultation."	January 28, 2013	
				Feb. 13, 2013 letter to Lori Crozier stated "CVRI records do not include all of [Aboriginal Group] aboriginal treaty right's that will be potentially infringed from the development of CVRI proposed project. All of [Aboriginal Group]'s aboriginal treaty rights that are brought forward must be addressed and accommodated."	February 13, 2013	
				concern of lack of economic opportunities raised by [representatives]	December 3, 2012	
				concern of lack of investment in education, employment and contracting raised by [representatives]	December 3, 2012	
				concern of lack of capacity building raised by [representatives]	December 3, 2012	
				concern of lack of being supplied environmental reports for review raised by [representatives]	December 3, 2012	
	Letter Jan. 28, 2013 to Lori Crozier "We have initiated contact with Coal Valley in order to ensure that we received proper consultation and an appropriate benefits agreement was to be completed. This contact has resulted in a denial of any further consultation and a refusal to entertain a benefits agreement."	January 28, 2013				



I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
15	Compensation	Compensation	Compensation	<p>Item raised during April 30, 2008 meeting by [Individual]: "What about direct investment".</p> <p>Concern raised by [representatives]</p> <p>Concern raised by [representatives]</p> <p>Feb. 13, 2013 letter where concern that has not been addressed stated; "economic benefits to accommodate for the infringement of [Aboriginal Group]'s aboriginal and treaty rights by the proposed project."</p> <p>Item raised in letter as concern that has not been addressed: "Social development funding to assist in the socio-economic impacts of the mine development, traffic increase and population increase with the surrounding areas of the project ([Aboriginal Group]) members"</p>	<p>April 30, 2008</p> <p>July 23, 2012</p> <p>December 3, 2012</p> <p>February 13, 2013</p> <p>February 13, 2013</p>	<p>The Supreme Court of Canada considers compensation to be a specific form of accommodation. Accommodation does not mean compensation as it is often implied, rather it means steps taken to address concerns and reach some form of reconciliation of competing interests. In an extreme case, typically one involving Title infringement, where compensation as a form of accommodation is called for, the SCC has made it clear that it believes any responsibility in this regard lies with the Crown, not third parties (Haida 2004: 55). The issue of Aboriginal Title is a complex legal issue beyond the scope of the present Project application. The Provincial and Federal Crowns' position is that Aboriginal Title in Alberta was extinguished with the signing of the numbered treaties; CVRI is aware of no court ruling or Crown position contradicting this, or evidence suggesting that a credible prima facie claim to Aboriginal Title covering the Project area on the part of Aboriginal Group I could be made. The issue of establishing the infringement of Treaty Rights to hunt, fish, and trap and undertake traditional uses is also a complex issue going beyond the scope of the current discussion, ultimately requiring the application of the so-called "Sparrow Test" in cases of substantial disagreement over the justification of any infringement (see R v. Sparrow). CVRI acknowledges that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. This has in fact resulted in the low threshold triggering a Duty to Consult, but adverse impact is a matter of degree (Mikisew 2005: 55). CVRI does recognize that the development of the Project can offer mutually beneficial opportunities in the forms of employment and contracting opportunities to potentially affected Aboriginal groups, and that CVRI can help provide community support to Aboriginal groups from time to time as a good "corporate citizen." It will continue to discuss ways in which Aboriginal Group I can potentially benefit from the development of natural resources in the region, but CVRI will not be offering compensation in the forms of payments or royalties to any Aboriginal group. Should Aboriginal Group I believe it is entitled to compensation in the form of lease or royalty fees, the Provincial and Federal Crowns should be contacted to discuss this issue. As noted above, CVRI is more than willing to continue discussions with Aboriginal Group I on an MOU with reasonable terms that offers mutual benefit to both parties.</p>
16	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	<p>It was stated that the [Aboriginal Group] is working, as well, to ensure that social and economic opportunities are identified with various industrial developers within their traditional use areas. Employment and contracting opportunities are of particular interest with any new or expanding development</p> <p>Interest in employment raised at Open House by community members.</p> <p>[Individual] expressed interest in employment opportunities for community members.</p> <p>During meeting [Chief] expressed want of allocation of long term job opportunities as worried about racism. [Individual] also brought up interest in job opportunities.</p> <p>[Individual] expressed he would like to set up a meeting to discuss employment and contracting opportunities.</p> <p>April 10, 2012 Meeting [Chief] stated he wanted to create employment, Chief stated "Lots of people interested in jobs at Coal Valley, young people, eager to learn." Meeting focused on emphasis of creating employment and training opportunities as problem for Nation.</p> <p>Catherine sent an email regarding scheduling a round table meeting to discuss employment opportunities &amp; "training to employment" options for short, medium and long term job prospects that qualified [Aboriginal Group] members could apply or strive towards.</p> <p>[Individual] stated he would like "business, education, and training opportunities ....to be a model community"</p> <p>[Individual] discussed interest in employment opportunities for [Aboriginal Group] community members.</p> <p>Feb. 13, 2013 letter to Lori Crozier (CEAA) which states as one of the concerns that has not been addressed: "Training and Employment opportunities for the [Aboriginal Group] members."</p> <p>[Chief] expressed there is difficulty in getting work here as opposed to the oilsands because of qualifications, he stated "here there are too many obstacles, grade 12, unions, etc."</p>	<p>September 19, 2006</p> <p>November 8, 2006</p> <p>April 14, 2011</p> <p>September 30, 2011</p> <p>February 14, 2012</p> <p>April 10, 2012</p> <p>May 27, 2012</p> <p>July 23, 2012</p> <p>December 3, 2012</p> <p>February 13, 2013</p> <p>April 10, 2012</p>	<p>Since 2006, CVRI has discussed the issue of employment opportunities and the potential incorporation of these into an MOU between the two parties. Some of the proposed terms include provisions aimed at improving employment opportunities for Aboriginal Group I members either directly or through support for contracting opportunities of Aboriginal owned businesses, and methodologies to encourage employment. CVRI support funding for training opportunities for industry related jobs has also been discussed. Discussions regarding an agreement between the parties may resume, thus any specific terms in this regard have not been agreed to. CVRI encourages members of the Aboriginal community to apply for jobs at the mine, both for trade and general labour positions, and has taken some steps to assist or accommodate Aboriginal circumstances in their employment. CVRI recognizes that in the past there have been obstacles that have stood in the way of employment, and will continue discussions toward alleviating them. That being said, Coal Valley is a union shop, and CVRI will neither implement a general Aboriginal employment "quota" nor one directed specifically at Aboriginal Group I or any other potentially affected Aboriginal group. Other specific obstacles regarding employment with CVRI is its distance from Aboriginal Group I.</p>

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
17	Training Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	[Individual] raised that he would like to see recruiting of people and training for job skills.	September 30, 2011	Since 2006, CVRI has discussed the issue of training opportunities and the potential incorporation of these into an MOU between the two parties. Some of the proposed terms include provisions aimed at improving training opportunities for Aboriginal Group I members either directly or through support for contracting opportunities of Aboriginal owned businesses, and methodologies to encourage employment in industry related jobs. Discussions regarding an agreement between the parties may resume, thus any specific terms in this regard have not been agreed to. CVRI encourages members of the Aboriginal community to apply for jobs at the mine, both for trade and general labour positions, and has taken some steps to assist or accommodate Aboriginal circumstances in their employment. We do have some trades apprentice positions at the mine. There is on the job training for equipment operators. CVRI and Sherritt are in the process of developing a corporate Aboriginal consultation plan. One of the items under a consideration is a scholarship or bursary program designed to help Aboriginal students fund continuing education and training. When and if such a program is developed, CVRI anticipates that Aboriginal Group I members would have access to it.
				Concern raised by [representatives] emphasizing that they can not talk to people about employment until they know there is training opportunities, there needs to be tools given to make change.	April 10, 2012	
				[Individual] stated he would like "business, education, and training opportunities ....to be a model community"	July 23, 2012	
				[Individual] discussed interest in training opportunities for jobs for [Aboriginal Group] community members.	December 3, 2012	
				[Individual] raised that he would like to see recruiting of people and training for job skills.	September 30, 2011	
				[Chief] stated "for the last couple of years the government has been trying to enforce changes on access to social assistance, lots of members no longer qualify, was 300 people and now only 80, not enough employment to compensate, need to train people."	April 10, 2012	
				In meeting addressed that Chief was aiming to work with Coal Valley to develop training program for [Aboriginal Group].	April 10, 2012	
18	Education Support	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	Item discussed with [representatives].	December 3, 2012	CVRI and Sherritt are in the process of developing a corporate Aboriginal consultation plan. One of the items under a consideration is a scholarship or bursary program designed to help Aboriginal students fund continuing education. When and if such a program is developed, CVRI anticipates that Aboriginal Group I members would have access to it.
				[Individual] raised interest in scholarships during meeting and incorporating into MOU	April 30, 2008	
19	Contracting Opportunities	Socio-economic development	development of Aboriginal owned business; increased employment for underemployed sector of Aboriginal society	Interest raised on numerous occasions by [Aboriginal Group] representatives.	October 10, 2007	CVRI has a procurement policy open to any business which provides competitive services. This policy has been provided to Aboriginal groups. CVRI has offered to receive and review available Aboriginal business proposals.
				Interest in contracting opportunities raised in meeting	April 30, 2008	
				[Individual] raised interest in contracting opportunities for [Aboriginal Group]	April 14, 2011	
				[Individual] emailed to inquire about a meeting to discuss employment and contracting opportunities associated with the project,	February 14, 2012	
				Interest was raised in contracting opportunities for [Aboriginal Group]	April 10, 2012	
				Interest was raised in contracting opportunities for [Aboriginal Group]	July 23, 2012	
				[Individual] raised interest in contracting opportunities for [Aboriginal Group]	December 3, 2012	
20	Ceremonial Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	Interest was expressed in funding for round dance	September 30, 2011	CVRI will continue to consider funding Aboriginal Group I community programs such as this through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration. When and if such a program is developed, CVRI anticipates that Aboriginal Group I would have access to it.

I	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
21	Cultural Program Support	Cultural Awareness and Survival	enhance intra- and inter-community awareness and cultural education	[Individual] raised interest in Coal Valley funding youth summer programs.	April 30, 2008	As noted, on several occasions representatives of CVRI and Aboriginal Group I have discussed funding initiatives for special educational initiatives involving youth. CVRI has been receptive to these discussions, but in all cases specific scopes and proposals as requested have not been delivered by Aboriginal Group I. CVRI will continue to consider funding Aboriginal Group I community programs such as this through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration. When and if such a program is developed, CVRI anticipates that Aboriginal Group I would have access to it.
				Interest was raised in funding a film for [Aboriginal Group] heritage for youth summer program	April 14, 2011	
				Item raised by [Aboriginal Group] representatives regarding funding for youth programs	April 14, 2011	
				[Individual] asked if Coal Valley could help fund their youth camp	April 10, 2012	
22	General Community Support	MOU	MOU	Following the open house, the [Aboriginal Group] members will meet with the Chief and Council to identify overlapping traditional use interests and draft an MOU that will act as a terms of reference for further assessment by the [Aboriginal Group]. The MOU will include definitions, guiding principles and data sharing requirements that both CVM and the [Aboriginal Group] would agree to.	September 19, 2006	CVRI has engaged in consultation with Aboriginal Group I since 2006 on its proposed developments including the Robb Trend Project and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Past consultation efforts spent considerable time discussing an MOU or other agreement that might encapsulate some concerns such as employment and contracting opportunities, other economic opportunities, and educational or community support in part to mitigate Aboriginal Group I concerns with the development. A decision by Aboriginal Group I consultation representatives resulted in an alternative track. Past consultation efforts with Aboriginal Group I resulted in a letter from Aboriginal Group I dated November 18, 2009 in which it indicates that consultation has been adequate, it has no further concerns, and provides endorsement for the proposed CVRI projects, including the Robb Trend Project. CVRI has continued to engage with Aboriginal Group I on the Robb Trend Project as part of the current regulatory process. In 2012, a third party entered into the consultation process on behalf of Aboriginal Group I, with the intent to pursue an Impact Benefits Agreement between Aboriginal Group I, the third party, and CVRI, similar to some claimed to be in existence in British Columbia. CVRI has never once indicated that it is unwilling to enter into such an agreement with Aboriginal Group I, past history being clear supporting evidence of this. However, CVRI has indicated to the third party and Aboriginal Group I that the draft terms and conditions set before it were far too aggressive to merit serious consideration by the proponent. In addition to going far beyond the scope of potential impact to Treaty Rights and traditional uses from the proposed Project, the proposed terms entered into territory such as revenue royalties over which CVRI has no jurisdiction. As stated, CVRI has been and still is interested in reaching a long-term written agreement with Aboriginal Group I, but stresses that the Supreme Court of Canada has ruled and the Provincial consultation guidelines indicate that the consultation process does not have to end in agreement about all issues, nor does it require a written agreement. Contrary to some of the statements made by Aboriginal Group I representatives, the purposes of any such agreements are not to provide compensation for the use of the land and past and future disturbances. To date Aboriginal Group I representatives have countered with demands that go far beyond CVRI's legal or moral responsibilities. As the scope of that agreement as requested by Aboriginal Group I goes well beyond the Robb Trend and its potential impacts to Treaty Rights and traditional uses, it may not be possible to conclude such an agreement to both parties' satisfaction prior to Project approval or development.
				Discussion of interest in MOU agreement with Coal Valley and [Aboriginal Group].	October 10, 2006	
				[Individual] notified Dan that the next steps would be interest in an MOU agreement with [Aboriginal Group]	November 15, 2006	
				[Individual] discussed interest in an MOU agreement for [Aboriginal Group].	January 19, 2007	
				Interest raised by [Individual] where he stated he was interested in an MOU with a goal to better the community. [Chief] also expressed interest in MOU to secure job opportunities.	April 10, 2012	
				Interest expressed in a community agreement and ensuring of job opportunities	September 30, 2011	
				thorough in-depth discussion by [representatives] on July 23, 2012.	July 23, 2012	
thorough in-depth discussion by [representatives] on Dec. 3, 2012.	December 3, 2012					

J	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	General Traditional Use	General Traditional Use	"The [Aboriginal Group] is a Treaty No. 6 First Nation ("[Aboriginal Group]"). Although [Aboriginal Group]'s reserve lands are approximately 400 km from the Robb Trend Project (the "Project"), [Aboriginal Group] members make extensive use of the Project area, Local Study Area (the "LSA"), and Regional Study Area (the "RSA") (collectively referred to in this letter as the "Project Region") for Treaty hunting, gathering and fishing."; "An initial canvas of [Aboriginal Group] members by our Traditional Use Staff indicates that at least 31 [Aboriginal Group] hunters, and their friends and families, hunt, fish and camp in the Project region."; "[Aboriginal Group] is confident that a proper assessment of our member's use of the Project Region would document at least 100 [Aboriginal Group] members hunting, camping, fishing and engaging in other traditional land uses in the area."	January 23, 2013	Following review of the Statement of Concern submitted by Aboriginal Group J, the Crown represented by the SREM Aboriginal Affairs Branch indicated that it would not require CVRI to consult with the group on the proposed Robb Trend Project. Despite this, CVRI met with representatives of Aboriginal Group J and their legal counsel on April 2, 2013 to discuss their concerns related to the Project. Issues discussed included contracting opportunities for Aboriginal Group J businesses, and a "compensation agreement" for use of the land given their hunting and fishing practices in the region. Steps forward were discussed including sharing of more detailed maps, sharing of example traditional use studies (completed), preparation of a proposed scope and scale for a traditional use study, and a site visit to the mine. Aboriginal Group J will be filing a statement of objection to the ERCB, and a reply to the Crown regarding its determination that CVRI did not need to consult with Aboriginal Group J regarding the Robb Trend Project. CVRI is currently considering the scope and scale of a proposed traditional use study submitted by Aboriginal Group J. No Aboriginal group consulted to date has demonstrated that access restrictions to the Project area will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake the Rights to hunt, fish, and trap for food on Crown lands as protected under Treaty or undertake other traditional pursuits. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional activities will not be restricted in the entire area upon Project approval and it will not be permanent, as it will mine the Robb Trend in stages over a 25-year period. The first stages will involve road construction as early as 2013, with the first mine pits opening in the center of the area as early as 2014, but with development of mining areas towards the southeast not until 2021, and in the areas west of the town of Robb not until 2027. The reclamation plans for the Robb Trend will incorporate Aboriginal traditional ecological knowledge to return the land to a more natural, useable state once mining activities have ceased. Reclamation activities will occur as mining in each pit area is finished, with all revegetation occurring within 5 years, and certification of reclamation (i.e. finding that vegetation and habitat returning to a productive state as expected) in 15-20 years. Thus, the first lands mined in the Robb Trend should be returning for use as the last lands are being mined. Those last areas mined should have reclamation certification by 2060; the earliest lands mined will have been returned for use well before that time. A large proportion of the surrounding region, with similar plants, animals, and other resources, will remain accessible for the undertaking of Treaty Rights and traditional uses during the development of the Project. The purpose of discussions with individual Aboriginal groups is an acknowledgement by both parties that proposed mining activities will restrict access to areas for general traditional uses, and that that restriction may have a negative, unquantifiable impact on portions of the Aboriginal communities, and that further consultation may result in the identification of mitigations or accommodations of potential impacts suitable to all parties.
				"[Aboriginal Group] members hunt elk, moose, deer, bear and other animals in the Project Region, as well as Bighorn Sheep to the west of the Project. [Aboriginal Group] also has a long tradition of the Project Region serving as an important hunting area for seasonal hunting trips to provide for community and cultural celebrations."	January 23, 2013	Bighorn Sheep are not typically found in the Project area or nearby, but has been observed as an accidental visitant to the CVM. Black bear are common in the area, and typically resilient to industrial activity. Please see below responses for information on elk, moose, and deer, and proposed wildlife mitigation strategies.
				"The EIA identifies several areas of impact to animals that are hunted by [Aboriginal Group] members. Adverse impacts on culturally important species will result from the Project due to: (1) habitat alteration, (2) sensory disturbance and effective habitat loss (3) habitat fragmentation, (4) direct mortality, and (5) barriers to movement. The direction of impact is universally negative, and these impacts explained in the EIA itself demonstrate how the Project will further directly and adversely affect [Aboriginal Group]'s Treaty rights."	January 23, 2013	Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Tasks that were completed during the wildlife assessment include: <ul style="list-style-type: none"> <li>• identify relative abundance, concentration areas, distribution patterns, and habitat associations of ungulates by means of winter aerial surveys, snow track-counts, and a spring pellet-browse survey;</li> <li>• identify small mammal, avian and amphibian presence, relative abundance and habitat association by means of snow track-counts, trapping small mammals, owl surveys, spring bird survey, breeding bird survey, migration survey, and amphibian survey;</li> <li>• compile a list of vertebrate species (excluding fishes) and identify their status as per the Committee on Endangered Wildlife in Canada (COSEWIC), the Canadian Endangered Species Conservation Council (CESCC 2006) and the General Status of Alberta Wild Species (ASRD 2005);</li> <li>• prepare a habitat map to identify the quantity and quality of habitat present in the Project Development Areas;</li> <li>• update wildlife use of the existing CVM by means of aerial survey, systematic monthly ground surveys, spring pellet-group counts, breeding bird survey and amphibian survey;</li> <li>• identify Valued Environmental Components for assessing the potential impact of the proposed development on ungulates, small mammals, birds and amphibians;</li> <li>• discuss biodiversity at the LSA and RSA scale;</li> <li>• review Traditional Use Studies (TUS) prepared for CVRI from a wildlife perspective;</li> <li>• discuss climate change with respect to changes in the Boreal-Cordilleran ecoregion that may affect wildlife; and</li> <li>• evaluate the potential impacts of the Project within a temporal and spatial perspective that incorporates existing and future demands by other users and developments by conducting a quantitative cumulative effects assessment for elk.</li> </ul> In order to reduce potential impacts to wildlife within the Project area, the following mitigation measures will take place: <ul style="list-style-type: none"> <li>• incorporate select native trees and shrubs such as alder and willow into re-vegetation activities;</li> <li>• maximize downed woody debris (stumps) through direct placement of top-soil and associated slash and stumps;</li> <li>• maintain and connect to core areas as many residual forest patches as possible;</li> <li>• maintain a 30 metre buffer zone of undisturbed natural habitat along well developed riparian corridors, where available;</li> <li>• plant coniferous trees at higher stem densities (&gt;180 stems per acre);</li> <li>• continue to maintain hunting and firearm restrictions on the reclaimed areas of the Project including after mining has ceased and until hiding cover on the mines is equivalent to that of natural closed forest cover types.; and</li> <li>• maintain haul truck and regular vehicle speeds of &lt;70 kph.</li> </ul> In order to evaluate and if need be adapt the mitigation measures, CVRI will also implement monitoring. Site wide monitoring will allow CVRI to determine the length of time it takes for wildlife to return to the landscape and what reclaimed landscape features are most desirable. All potential effects are noted to be reversible over the short-term or long-term depending on the type of effect. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features.
			displacement of game animals from Project area	"[Aboriginal Group] is very concerned that these sweeping habitat loss and alteration resulting from the Project will negatively impact moose and elk populations, and many other animal populations, in the Project Region."	January 23, 2013	The development of the Project, particularly the development of the mine pits, soil and rock stockpiles, dumps, and roads, will definitely impact plants and animals in the disturbance zones through displacement. Most wildlife will likely be displaced to adjacent habitat patches. Ungulates will be temporarily displaced by active mining as they are unable to cross a pit disturbance. This displacement will be restricted to local use as there are no indications of long distance or major seasons migrations in the LSA. Large amounts of moderate quality moose habitat is available throughout the RSA for moose thereby moderating the affect of habitat change caused by mining. High quality moose habitat on the Project and other areas associated with mixed wood of the Lovett Ridge will be reclaimed with a closed forest regeneration forest of lesser habitat quality. The impacts of the Project development on moose in the region can be mitigated by: implementing reclamation techniques appropriate for moose, establishing a variety of vegetation types and promoting understory complexity in regenerated forests that includes willow species, aligning reclamation and other re-vegetation efforts to maintain and improve moose habitat, taking steps to ensure core security areas are provided for wildlife, implementing appropriate monitoring, cooperating with the province and other industry on access management and other relevant management issues. An examination of elk observations during Fish and Wildlife moose surveys in the area on the north side of the existing CEA study area indicates scattered elk in low numbers. There is not a substantive elk population in this area. Ungulates and other wildlife respond positively to predictable human activity by a process of habituation which allows the animal to gradually accept new experiences in the absence of negative feedback. Elk, moose, mule deer, white-tailed deer and other wildlife on the CVM make use of the reclaimed landscapes in the presence of active mining. It can be expected that animals local to the LSA area will respond in the same positive manner as at the CVM. It is expected that elk and deer will respond positively to the early stages of upland reclaimed and re-vegetated areas on the LSA particularly in the Robb West, Main and Central zones where there is extensive mixed wood and deciduous habitat adjacent the disturbance area. The impact of mining development will involve direct mortality through clearing and loss of habitat during mine development and changed composition in small mammal communities in the early stage of reclamation. Small mammals will be temporarily displaced by active mining as they are unable to cross a pit disturbance. Other forest dependent small mammals (red squirrel, snowshoe hare) will be expected to use the regenerated forest and its understory once it becomes established. Understorey development is a necessary component of snowshoe hare habitat. The density of small mammals in reclaimed grasslands has been shown to be similar to undisturbed habitats (Hingten and Clark 1984). After initial grassland establishment, the number of small mammal species is expected to be similar to those on undisturbed similar habitats. Wolverine status is listed as transient/migrant and abundance as rare in the study region. The wolverine is listed as "may be at risk" under Provincial Status (2010) and as "special concern" Federally Listed under COSEWIC. The Red Fox status is listed as a permanent resident in the study region but with a scarce abundance. The Provincial Status (201) for the fox population is listed as "secure". Muskrat and beaver have been observed using the reclaimed lakes on the CVM (Bighorn 1995:24). Many of the species on the CVM are birds associated with water habitats which would have been poorly represented in the pre-development ecosystem. While bird abundance and types of species may change as a result of mining activity it appears that the number of bird species will be similar or may increase as a result of adding new habitats e.g. upland grassland, shrubland, lake, pond and wetland development. The edge associated with the Project should enhance tree growth potential both natural and through reclamation planting as well as promoting maintenance of bird species occurrence during active mining. Reclaimed lakes and ponds on the CVM support breeding water birds, i.e., Canada Goose, Mallard, Bufflehead, Common Goldeneye, Barrow's Goldeneye, Killdeer, Greater Yellowlegs, Spotted Sandpiper; probably or possible breeding water birds i.e., Ring-necked Duck, Lesser Scaup, Solitary Sandpiper, summer visitants i.e. Common Loon, Osprey, and several species of waterfowl and shorebird migrants not seen elsewhere in the RSA, i.e., Semipalmated Sandpiper, Western Sandpiper, Least Sandpiper, Baird's Sandpiper, Short-billed Dowitcher. CVRI has also planned to undertake reclamation activities that specifically enhance wildlife use of the reclaimed area. Specifically provide diverse vegetation communities and complex arrangements of vegetation and landscape features.

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2	Potential Impact to Treaty or Aboriginal Right	Hunting		"The EIA identified 7 "Species of Concern" species within the LSA, by either provincial or federal authorities, namely, grizzly bear, bobcat, lynx, fisher, long-tailed weasel, wolverine, and badger. With the exception of grizzlies, as discussed below, many of these species are hunted opportunistically by [Aboriginal Group] in the course of hunting moose, elk and sheep."	January 23, 2013	Grizzly bear and lynx are discussed in responses below. Wolverine status is listed as transient/migrant and abundance as rare in the study region. The bobcat, long-tail weasel, and badger are not likely inhabitants of the study area. According to CR #7, fishers are listed as Sensitive by the Alberta Fish and Wildlife Division (2010), and little is known of their ecology in the foothills of Alberta. They are an uncommon species in the RSA with occurrence linked to older mixedwood forests in the lower elevation eastern portions. This species is not commonly trapped in the RSA with harvest limited to eastern RFMAs. High and very high quality fisher habitat currently comprises about 6% of the Project mine permit area (LSA). Fisher tracks were observed in the Project permit area but at much lower (40 times) densities than marten. The greatest threats to regional fisher populations are habitat alteration at maternal denning sites and over-trapping. Over-trapping is unlikely to occur because fisher harvest is very low in the region and subject to quotas. The government can reduce quotas at any time if concerns over regional fisher occurrence or population density arise. A study of habitat alteration showed the predicted supply of high and very high quality fisher habitat over time considering effects of the Project and other planned and reasonably foreseeable land uses. The supply of high/very high fisher habitat increases steadily over time with increases of 273% and 444% for the Embarras and Lendrum BMUs from baseline to T50. Based on the above evidence, the combined effects of the Project and past, present and future land actions on fisher populations are rated as insignificant. A total of 22 Registered Fur Management Areas (RFMAs) overlap in whole or in part with the RSA. Fur harvest return information for the period 1985 to 2001 was obtained from Alberta Sustainable Resource Development for the RFMA. Fur returns for 17 different species were reported. This included red squirrel (13,348), muskrat (3,649), beaver (3,401), marten (1,796), weasel spp. (1,531), coyote (896), wolf (236), lynx (133), mink (128), fisher (50), red fox (47), black bear (18), badger (14), striped-skunk (7), wolverine (6), river otter (4) and raccoon (1). The average numbers of captures per year per trap line for Valued Environmental Component (VEC) species were: lynx (0.42), marten (5.17), fisher (0.16), and wolf (0.71). RFMAs 1516, 2619 and 2256 will be directly affected by the proposed development of the Project permit area. Over a 16 year period, RFMA 1516 reported an average number of lynx (0.4/year), fisher (0.19), marten (5.4/year) captures and reported below average wolf captures (0/year). Over a 15 year period, RFMA 2256 reported above average marten (8.5/year), and fisher (0.13) captures and below average lynx (0.3/year) and wolf (0.1/year) captures. Over a 17 year period, RFMA 2619 reported below average capture rates for lynx (0.2/year), marten (1.2), fisher (0.12), and wolf (0.6). Caution must be used when interpreting this data. Capture rates can vary widely and may reflect trapper effort and fur prices as much as it does of animal abundance. Capture rates can also reflect the size of the RFMA. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Trapping is likely to continue in the RSA. It is reasonable to assume that future trapping levels will occur at average levels from 1985 to 2001. As noted above, Project development will occur over time, and access to mine areas to undertake Treaty Rights to trap will be restricted in active mining areas for a period of time. However, areas surrounding the Project will still be available to undertake Treaty trapping rights, and Project development and reclamation will be complete by 2060, returning those lands for trapping uses. In addition to mitigations mentioned above, proposed mitigation strategies to help protect these mammalian carnivore species include: 1) Monitor the effectiveness of measures designed to increase understory cover (downed woody debris, shrubs, tree density) on reclaimed mine lands for marten, fisher and lynx. Design a program that includes establishment of specific targets; 2) Monitor response of marten, fisher lynx to existing and planned mine land reclamation using winter tracking techniques; 3) Determine if habitats required for fisher maternal denning occur on or immediately adjacent to the Project and assess their levels of use by fisher; 4) Monitor the effectiveness of establishing and maintaining hiding cover for grizzly bears near Project edges and adjacent to main roads; 5) Measure and monitor human use levels of linear features during summer, winter and fall (hunting) seasons. Assign this as a primary task of the 'bear warden' position. Use this data to design road closure plans; 6) Monitor the effectiveness of voluntary and enforced road closures including gating; 7) Monitor and study specific use of the existing CVM and proposed Project by grizzly bears. Investigate the extent to which existing mines in the region serve as attractive forage sources for grizzlies, and study implications for subregional mortality. Consider non-intrusive methods including DNA hair snagging; 8) Continue long-term, multi-species winter monitoring of mammals (carnivores and prey) to regional habitat fragmentation using the tracking data conducted in 2007, 2009 and 2011 as a starting point.
			displacement of lynx from Project area	"The greatest threat to the lynx are over-trapping and broad scale effects on populations of their key prey. As a result of the Project, lynx movement will be limited on the mine site until the requisite shrub or forest cover re-establishes, which will not occur until at least 10-25 years post construction. [Aboriginal Group] has a direct interest in the protection of this culturally important species and the associated exercise of [Aboriginal Group]'s rights."	January 23, 2013	According to CR #7, the main potential causes of lynx mortality arising from the Project are: 1) vehicle collisions from coal haul; and, 2) fur harvest. Unlike cougars, lynx are not a big game species in Alberta. Therefore, increased legal hunting pressure due to improve human access will not likely occur. Trapping of lynx is quota-based and recent lynx harvest has not been excessive. Vehicle speeds are reduced on mines to <70 kph further reducing the likelihood of vehicle collisions. Overall, it is predicted that development of the Project is unlikely to cause an increase in direct lynx mortality. After the immediate maximum effect of construction, the losses of lynx habitat are predicted to be ameliorated over time by natural aging of existing forests and regeneration of forest on reclaimed lands. Succession of early post-seral clear cuts and Project reclamation to young forest with abundance hare populations are the main reasons for projected increases in quality lynx habitat. Planned timber harvest in the RSA will provide an optimal mix of regenerating forest and older forest that lynx need for forage and reproduction (denning). Surface coal mining will offer the same conditions if mitigation measures recommended are followed; and, habitat supply projections for lynx predict that supply of high and very high quality lynx habitat will significantly increase from baseline to T50 in the RSA (277% in Embarras BMU and 193% in Lendrum BMU) largely because of planned timber harvest, beetle salvage and surface coal mining.
			displacement of grizzly bears from Project area	"Another important species to [Aboriginal Group] is the grizzly bear, which our members used to hunt but no longer do...This animal is found throughout the LSA, and is at risk for direct mortality, specifically direct human-caused mortality...The existing Coal Valley Mine has already significantly changed landscape structure, composition and food production in the permit area for grizzly bears. It is anticipated the Project will have the same effects. These effects threaten the grizzly bear species. The grizzly bear will be displaced from the Project mine footprint and permit area during the active mining period. Displacement of the grizzly bear will be a direct result of construction noise and blasting. The mined lands will act as a barrier to grizzly bears, and will act as a serious barrier during active blasting and hauling. With the Project seriously compromising grizzly bear movement and habitat, it is clear that the Project will have a material effect on the grizzly bear. [Aboriginal Group] is concerned that the Project will demonstrably contribute to the extirpation of grizzly bears from this area of Alberta. Accordingly, as part of consultation on the Project, [Aboriginal Group] will be seeking a comprehensive plan from responsible federal and provincial ministries and Coal Valley to ensure that grizzly bears are able to survive and flourish in the Project Region."	January 23, 2013	Grizzly bears will likely be displaced from portions of the Project mine footprint and permit area during the active mining period. Displacement will result from construction noise and blasting. At some point shortly after reclamation grizzly bears will be attracted to the herbaceous forage and ungulates on the Project mine footprint as was observed on the Luscar, Gregg River and CVM reclaimed mine areas. The mined lands will not act as a serious barrier to grizzly bears, with the possible exception of during active blasting and hauling. In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. The greatest threat to regional grizzly bear populations is human-caused mortality caused by legal and illegal hunting, self-defence kills by ungulate hunters, and vehicle/train collisions. Any land use that results in increased access or use of access by individuals carrying firearms is a threat to grizzly bear population persistence. Any roads with vehicle speeds greater than 70 kph also have potential to result in increased grizzly bear mortality. Sources of domestic garbage at the CVM are contained in appropriate secure containers and transported to the licensed landfill in Hinton as per the Approval conditions. Problem bear actions at mines in the Coal Branch region are of extremely limited occurrence. Grizzly bears actively select habitats and foods that provide them with the greatest possible net digestible energy (Hamer and Herrero 1983, Pritchard and Robbins 1989). Mining and subsequent reclamation of the existing CVM has significantly changed landscape structure, composition and food production in the permit area for grizzly bears. Mining and reclamation at the CVM has resulted in removal of tree canopies, leading to increases in availability of high energy herbaceous plant material (clover, thistles, legumes) and an increase in ungulates (elk, deer) responding to increased forage and edge habitat. There is strong evidence to suggest that ungulates and plants used for reclamation are sought and used extensively by grizzly bears occurring in the vicinity of the CVM area. Similar findings were observed in the existing Luscar and Gregg River mines (Stevens and Duval 2005; Kansas and Symbaluk 2011). Bears using the reclaimed Luscar and Gregg River mine lands were on average larger than bears in an adjacent un-mined Subalpine and the Gregg/Luscar permit block was considered to be an attractive habitat for grizzly bears and a source for enhanced cub production (Kansas 2005). If similar reclamation measures are used on the Project then impacts on grizzly bears from a habitat alteration perspective will likely be positive within 10 years post-construction. In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. This assertion is based on the fact that carrying of firearms is not permitted within any mine permit areas and traffic speed control is practiced. It is further supported by the fact that no grizzly bear mortalities have occurred on mine permit areas in 40+ years in the Coal Branch region (Symbaluk 2008). This does not diminish the seriousness of cumulative effects on grizzly bear mortality in the RSA and broader Yellowhead region.
			displacement of caribou from Project area	"[Aboriginal Group] is also concerned about caribou. Although caribou is a traditional food source, our members now mostly refrain from hunting caribou due to dwindling populations brought about by resource development in caribou ranges. We note that the South Jasper Caribou Herd's range area is very close to the Project Region...The Caribou Plan also notes that caribou range areas are only 'approximate' so it is possible, given the proximity of the Project to the South Jasper Caribou Herd, that the Project might impact this herd."	January 23, 2013	During the wildlife studies presented in CR #14, no signs of caribou in the LSA or RSA were observed. The range of the South Jasper Caribou Herd is in fact not near the Project area, and no potential impacts are anticipated.

J	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
				<p>"[Aboriginal Group] hunting trips to Project Region involve extended camping and members also often fish in the Athabasca, McLeod, Embarrass and Erith Rivers."</p>	<p>January 23, 2013</p>	<p>Rainbow Trout were the most common and widespread species within the LSA and RSA and were found in 38 of the 42 waterbodies sampled during baseline fisheries investigations. Bull Trout, Burbot, Lake Chub, Longnose Sucker, and Spoonhead Sculpin were encountered much less frequently than Rainbow Trout but were still found at a number of different locations. Other species, including Arctic Grayling, Brook Stickleback, Brook Trout, Longnose Dace, Mountain Whitefish, Northern Pike, Pearl Dace, Trout-perch, and White Sucker were rare and were only found in one or two waterbodies. Arctic Grayling are listed as Sensitive and is considered a Species of Special Concern in Alberta (ASRD 2010). Populations have decreased in the past few decades. Threats provincially include increased harvest pressure from improved road accessibility, blocked migration routes and altered stream flow resulting from improperly placed culverts in newly constructed roads. Brook Trout are listed as an exotic/alien species (ASRD 2010). They were introduced into Alberta in the early 1900's and are abundant in many foothills streams and isolated lakes. Bull Trout are listed as Sensitive and is considered a Species of Special Concern in Alberta (ASRD 2010). Over-harvesting has led to a decline in population and while angling regulations may lead to recovery, habitat degradation and competition from introduced species may contribute to further declines. Introduced stocks of Rainbow Trout in Alberta are Secure. However, the native Athabasca Rainbow Trout population has suffered introgression from introduced trout in the Athabasca drainage system. The native species is currently considered At Risk (ASRD 2010) but Alberta's Endangered Species Conservation Committee has recommended that Athabasca Rainbow Trout be listed as Threatened under the Wildlife Act. Rainbow Trout (At Risk status) were widespread in the Project and were often the only species found, or historically reported, in study streams. As such the majority of watercourses had a moderate diversity ranking.</p> <p>Aquatic resources issues related to construction, operation, and reclamation of the Project were generally linked to potential changes to physical habitat components, changes in flow regimes, changes in surface water quality, and changes in resource access. The impacts to fish populations and benthic invertebrates as a result of the mining and pit filling is expected to be minimal since it is assumed that downstream flows will be managed to adhere to instream flow guidelines (AENV 2011). In general, peak flows will be reduced and low flows will be increased. This attenuating effect may have some impact on fish habitat composition and could also benefit fish populations by reducing the intensity of high flow events that can adversely affect fish, particularly during the early life stages. No significant water quality changes are expected and water quality in the end pit lakes will likely be suitable for aquatic life. Measures to reduce or mitigate potential effects were identified using proven strategies and combined expertise of professionals. Potential local effects on the fisheries Valuable Environmental Component's (VEC) associated with direct habitat loss or alteration are expected to be fully mitigated with properly implemented mitigation strategies. CR #2 (Section 5.4) of the Project application provides details of the numerous mitigation strategies proposed to protect fish resources, in the areas of surface water management and erosion control, haulroad crossing construction, stream diversions, management of stream flows, public access restrictions, and habitat enhancement. Therefore, no cumulative effects on fisheries VECs associated with direct habitat loss or alteration are expected. Potential adverse effects relate primarily to direct physical habitat alteration/loss, changes in surface water hydrology and water quality issues. With mitigation there will be an insignificant impact on the fisheries VEC's. CVRI is currently working with the Department of Fisheries and Oceans Canada (DFO) in creating a conceptual compensation plan to be able to uphold the principle of 'No Net Loss' to fish habitat. This plan will be required to be approved and implemented prior to disturbance. Any operational works that require a harmful alteration, disruption and destruction (HADD) of fish habitat will require to be applied for with DFO. The compensation plan will be referred to in establishing site specific compensation related to each working (crossing, diversion).</p>
3	Potential Impact to Treaty or Aboriginal Right	Fishing	removal of fish resources/habitat in Project area	<p>"[Aboriginal Group] also has concerns with respect to water hydrology and the impacts of the Project on the environment and fish and fish habitat due to increased emissions and other impacts on water bodies in the area used for traditional fishing purposes. Sediment and certain chemical contaminants that have chronic or lethal effects on aquatic biota will enter the aquatic ecosystem during mining. The EIA notes that changes to physical habitat components, flow regime, water quality and access are all factors that affect fish habitat potential. These effects will directly and adversely affect [Aboriginal Group]'s Treaty fishing rights."</p>	<p>January 23, 2013</p>	<p>The responses above discusses some of the specifics of local fisheries and the low potential for impact to those resources and associated fishing rights. Potential changes in surface water quality in the RSA were assessed as insignificant (Section E.11, CR# 11) and are not expected to significantly impact fish populations in the RSA. No additional access to water bodies in the RSA is expected to occur as a result of the Project. CVRI will monitor watercourses within the watersheds to be affected by the Project. Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including:</p> <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval.</li> </ul> <p>The surface hydrology assessment presents proposed water management plans and addresses the potential impact of the Project on:</p> <ul style="list-style-type: none"> <li>• the quantity of surface water flow and stream behaviour during high, average and low flow conditions; and</li> <li>• sediment concentrations in local and regional streams.</li> </ul> <p>Various water management and sediment control measures will be implemented for the Project during operations, reclamation, and closure, including:</p> <ol style="list-style-type: none"> <li>1) Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval;</li> <li>2) Release of water pollutants from the site such as oil and grease is controlled. With the installation of oil booms on the impoundments and immediate containment of oil in the event of a spill, there is little danger of these materials contaminating surface waters. Components of the water handling system will be designed according to the governmental specification and the systems will be operated in accordance with regulatory approval requirements; and</li> <li>3) Water from pit dewatering operations will be directed to settling impoundments for treatment prior to discharge of surface waters. In impoundments, pit water will mix with surface runoff. If necessary, flocculants will be used to enhance the rate of settlement of suspended solids. Impoundment discharges will be subject to conditions in the EPEA approval;</li> <li>3) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; and</li> <li>4) All mine-affected water will be treated prior to its release in to the receiving waters to reduce potential effects from loading of suspended sediments and potential effects of water quality variables typically associated with suspended sediments (e.g., total aluminum and total iron). [continued below]</li> </ol>
				<p>continued from above</p>		<p>[continued from above] CVRI will pay particular attention to selenium (see below). The mine wastewater treatment program similar to the one currently in use at the CVM will be established to minimize downstream siltation and minimize downstream effects on surface water quality; 5) With respect to selenium, the CVM will continue an effective water quality monitoring program including a focus on selenium concentrations. The objective will be to observe water quality relative to baseline values to identify any changes over time. Should a significant increase in selenium levels be noted an investigation will be undertaken to identify possible sources and mitigation plans will be implemented; 6) Where necessary, interim erosion/sediment control measures will be utilized until long-term protection can be effectively implemented; 7) Minimization of the time interval between clearing/grubbing and subsequent earthworks, particularly at or in the vicinity of watercourses or in areas susceptible to erosion; 8) Slope grading and stabilization techniques will be adopted. Slopes will be contoured to produce moderate slope angles to reduce erosion risk. Other stabilization techniques used to control erosion include: ditching above the cutslope to channel surface runoff away from the cutslope, leaving buffer (vegetation) strips between the construction site and a watercourse, placing large rock rip rap to stabilize slopes; 9) Whenever possible, construction activities in close proximity to watercourses will be carried out during periods of relatively low surface runoff in late fall, winter and early spring (from October to April). A 30 m buffer (vegetation) strip will be left between construction sites and watercourses except at stream crossings and diversions; 10) Temporary measures to control erosion before a vegetation cover is reestablished, including: diversion ditches, drainage control, check dams, sediment ponds, sumps and mulches; 11) Installation of surface runoff collection and treatment systems to control groundwater seepage from road cuts and surface runoff from disturbed areas. Surface runoff will be directed to settling impoundments for removal of settleable solids; 12) The design and construction of all stream crossings will be done in compliance with the Alberta Code of Practice for Watercourse Crossings and associated guidelines. This means that all stream crossings constructed by the Project will meet regulatory requirements for protection of fish resources and aquatic habitat; this will also effectively mitigate against effects on surface water quality.</p> <p>Mining activities are expected to reduce high flows, and low flows are expected to either remain the same, slightly decrease or slightly increase. Annual runoff may have modest variations dependent on mining activities at the time (e.g. pit dewatering). Temporary water diversions will also contribute to some slight variations in flow quantity for short periods of time. Instream flows will be maintained by bypass pumping. Depending on the extent of the disturbance footprint within the watershed the significance to flow quantity may remain the same, increase or decrease depending on the mine progression and seasonal variability. Dewatering of the groundwater around or in the mine pits, to permit mining, increases surface flows. This is usually a minor flow component of the overall surface runoff rate from an area. The magnitude of the flows is small and regulated by pumps. If the sump or dewatering area is well laid out and separated from active mining, the effect on sediment loads can be negligible. Impoundments such as settling ponds or end pit ponds or lakes generally reduce downstream peak flows as a result of storage. Increases in low flows can result from a more gradual release of the water stored in the impoundment. Depending upon their size, pond evaporation losses may be significant at times but is near balanced with direct precipitation on an annual basis. Depending upon their size and efficiency, impoundments can reduce sediment loads significantly. End pit ponds will reduce flows when initially filling but can provide opportunities for enhancement. For open water bodies (lakes, ponds and to some extent wetlands), lake evaporation essentially replaces evapotranspiration in equation (1) above with groundwater having both an inflow and outflow component. After initial filling and stabilization of the groundwater level, such that the net regional groundwater recharge is the same as pre-mining, it may be assumed that groundwater inflow equals outflow on an average annual basis. It should be noted that even large differences in net groundwater inflow/outflow for the water bodies typically will have minor net surface flow impacts because of the small areas of the ponds relative to the basin sizes and the smaller groundwater flow component compared to the surface runoff component. Diversions will be sized and designed to convey peak flows safely considering the life of the diversion. As a result, water diversions do not impound water or cause losses due to infiltration (if lined) and, if returned to the same stream, will not affect the magnitude of downstream flows. All defined watercourse crossings will be designed, and constructed, to meet or exceed the regulatory requirements for approval under the provincial Water Act and the federal Fisheries Act and Navigable Waters Protection Act. If appropriately designed and constructed, these crossings will have negligible effect on flows or sediment loads to the streams.</p>

J	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
4	Consultation	Consultation	Consultation Process	"A preliminary review w of the Project application documents by [Aboriginal Group] has raised very significant concerns about the Project. With regard to consultation it is clear that there simply has been no consultation with [Aboriginal Group] at all. There is no valid reason for the lack of consultation. The Project is within the Treaty No. 6 region. The Alberta Aboriginal Relations website provides list of the 18 Treaty No. 6 First Nations for the purpose of consultation, including [Aboriginal Group]. Yet there seems to be no indication, whatsoever, that Coal Valley made an effort to notify all of the Treaty No. 6 First Nations who possess rights in the Project Region. There is also nothing, it would seem, to indicate that Coal Valley asked AESRD which First Nations in the Treaty No. 6 region actively exercise Treaty rights in the Project Region. The traditional territory of the [Aboriginal Group] encompasses the Project Region and we have provided our traditional territory map to the ERCB, AESRD, and other Government of Alberta officials more times than we can recall, including as evidence in other regulatory processes."	January 23, 2013	Following review of the Statement of Concern submitted by Aboriginal Group J, the Crown represented by the SREM Aboriginal Affairs Branch indicated that it would not require CVRI to consult with the group on the proposed Robb Trend Project. CVRI is not responsible for determining which Aboriginal groups need to be consulted with. The Crown is ultimately responsible for consultation given that the Duty to Consult is vested in the Honour of the Crown, not CVRI to whom only aspects of the consultation process have been delegated. CVRI discussed the list of potentially affected Aboriginal groups it was required to consult with during the development of the Aboriginal consultation program; Aboriginal Group J is not included on that list. Therefore, discussion of the process of consultation and specific concerns with it are issues that needs to be raised with the Crown. One of the purposes for the inclusion of concerns such as this into this record is to help communicate on-going concerns with the consultation process to the Crown. Despite this, CVRI met with representatives of Aboriginal Group J and their legal counsel on April 2, 2013 to discuss their concerns related to the Project. CVRI is currently considering the scope and scale of a proposed traditional use study submitted by Aboriginal Group J.
5	Potential Impact to Treaty or Aboriginal Right	Hunting	loss of access to land available for hunting in Treaty 6 area	"In light of [Aboriginal Group]'s extensive Treaty rights use of the Project Region, it is not surprising that over several decades our members have had frequent contact with AESRD field staff in the area. [Aboriginal Group] members have also registered many Bighorn Sheep kills with AESRD that were shot on hunting trips which emanated from hunting camps in the Project Region. Accordingly, had AESRD taken the time to confer with its field staff in the area, we have little doubt that [Aboriginal Group] Treaty rights use in the Project Region would not have been overlooked. On a general level, [Aboriginal Group] is concerned with the ever diminishing amount of Crown land in the Treaty No. 6 region. Increasingly our members must make special efforts to hunt, fish and trap in areas that are further and further from our community. This concern has been expressed in a very formal way to the Government of Alberta in other consultation processes. The Project will have direct and significant impacts on approximately 75 km (7500 ha) of Crown land. The right of the provincial Crown to take up lands for development under the Treaty is not limitless. Our Treaty rights to hunt, fish and trap cannot be rendered meaningless by development.	January 23, 2013	The Provincial and Federal Crowns are responsible for the administration of Crown lands with respect to the provisions entered into under Treaty 6 and modified by the Natural Resources Transfer Act. It is beyond the jurisdiction of CVRI to either quantify or comment on the overall effects of the Crown's "taking up of land" as allowed under the Treaty in the past century and a half across the Provinces of Alberta and Saskatchewan as it relates to Aboriginal Group J or any other Aboriginal group. That being said, no Aboriginal group consulted to date has demonstrated that access restrictions to the Project area will have a specific, particularly deleterious, non-mitigable effect on individual or collective abilities to undertake the Rights to hunt, fish, and trap for food on Crown lands as protected under Treaty or undertake other traditional pursuits. CVRI does acknowledge that its Project will occupy Crown land otherwise available for the exercise of Treaty Rights and traditional uses for a period of time during mine development, operation, and reclamation. CVRI notes that access to proposed Project lands to pursue Treaty Rights and undertake traditional pursuits will not be restricted in the entire area upon Project approval nor will it be permanent, as it will mine the Robb Trend in stages over a 25-year period as discussed above.
6	Consultation	Consultation	Consultation Process	"This fact [claimed [Aboriginal Group] traditional use of the Project area] is well known to, (or ought to be known to) Alberta Environment and Sustainable Resource Development ("ASRD"). Even so, neither the Government of Alberta nor the Project proponent, Coal Valley Resources Inc. ("Coal Valley"), have notified [Aboriginal Group] about the Project or made any other efforts to consult with [Aboriginal Group] about the potential impacts of the Project on our Treaty rights and related traditional land uses in the Project Region. [Aboriginal Group] only became aware of the Project while reviewing the "Summary of environmental assessment activity - current projects" section of AESRD's website to review information about a different resource project...We are deeply concerned about the impacts of this Project on [Aboriginal Group]'s Treaty rights use in an area of Crown land that is a significant and preferred hunting ground for [Aboriginal Group] members. Accordingly, we call on Coal Valley, the Governments of Alberta and Canada, and the relevant regulatory bodies to take immediate action to address the fact that [Aboriginal Group] has been ignored with respect to the proposed Project, including if necessary, express confirmation that [Aboriginal Group] is permitted to file Statements of Concern or similar submissions regarding the Project despite the passage of any and deadlines for doing so."	January 23, 2013	Following review of the Statement of Concern submitted by Aboriginal Group J, the Crown represented by the SREM Aboriginal Affairs Branch indicated that it would not require CVRI to consult with the group on the proposed Robb Trend Project. CVRI is not responsible for determining which Aboriginal groups need to be consulted with. The Crown is ultimately responsible for consultation given that the Duty to Consult is vested in the Honour of the Crown, not CVRI to whom only aspects of the consultation process have been delegated. CVRI discussed the list of potentially affected Aboriginal groups it was required to consult with during the development of the Aboriginal consultation program; Aboriginal Group J is not included on that list. Therefore, discussion of the process of consultation and specific issues with it is an issue that needs to be raised with the Crown. One of the purposes for the inclusion of concerns such as this into this record is to help communicate on-going concerns with the consultation process to the Crown. Despite this, CVRI met with representatives of Aboriginal Group J and their legal counsel on April 2, 2013 to discuss their concerns related to the Project. CVRI is currently considering the scope and scale of a proposed traditional use study submitted by Aboriginal Group J.
				"However, the Government of Alberta and certain federal departments have overlooked the well-known and significant use by our members of the Project area and environs. Further, we have not received any meaningful response from Alberta to our letter of January 23, 2013. It is frustrating for us that Alberta insists on a 21 day timeline for responses from First Nations, but nonetheless operates as though the Crown is entitled to take as much time as it likes to respond to First Nations. For all of these reasons, we will be taking steps to file objections in the regulatory process over the next couple of weeks. Whitefish is taking this step to protect our interests and our right to participate in the regulatory process. Please do not view these steps as an expression of hostility towards Coal Valley or the Project."	February 21, 2013	

K	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	General Traditional Use	General Traditional Use	Judging from the map information provided by CVM that a portion of [Aboriginal Group] traditional use area includes the mine and proposed expansion areas, this should be confirmed with [individual]	October 3, 2006	Early on in its development of the Robb Trend Project, CVRI met with Aboriginal Group K to discuss any concerns that it may have with the Project. In a letter dated January 16, 2007, and an email and results of map review of March 8, 2011, Aboriginal Group K indicated that the Project falls outside of its traditional use territory and therefore has no further concerns with the Project. CVRI has continued and will continue to provide Aboriginal Group K with relevant Project information, and other information pertaining to CVRI operations.



L	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
1	Potential Impact to Treaty or Aboriginal Rights	General Traditional Use	General Traditional Use	[Individual] expressed that the [Aboriginal Group] are not against development but want their area protected.	June 27, 2007	CVRI has been consulting with Aboriginal Group L about the Robb Trend Project and potential impacts since 2006, and believes that its efforts on the delegated aspects of the consultation process can be considered well beyond reasonable in the assessment of adequacy. Through the years CVRI has heard group concerns regarding potential environmental impacts, particularly about potential impacts to water quality, and provided information regarding its proposed mitigations in this regard. These efforts included the collection of traditional ecological knowledge data from the community regarding proposed CVRI extension areas including the Robb Trend, which CVRI will use to help plan reclamation strategies to return to land to a more useable state for the exercise of Treaty Rights and traditional uses following mining. CVRI will not be offering compensation in the forms of payments or royalties to any Aboriginal group for any direct effects of the Project or for any regional cumulative effects. On January 31, 2010, Aboriginal Group L leadership entered into a written agreement, in part providing community approval for the development of the Robb Trend. This agreement is a recognition by both parties that potential project benefits to the community in the form of employment or community support represent adequate mitigation of the potential loss of this area for undertaking traditional pursuits for the duration of mining activities and prior to adequate reclamation. Through this agreement CVRI continues to consult with Aboriginal Group L regarding its operations, and continues to work with the community on support initiatives including education and employment for the duration of the development of the Project as specified in the agreement.
				[Aboriginal Group] representatives expressed that they were concerned with the cumulative effects on water, berries, hunting and fishing	July 28, 2009	
				The TLU stated "Although they do not use the proposed Robb Trend Project area as actively as areas near the camp, they recognize the importance of the natural resources in the area, and that the project will impact those plants, animals, and other resources. The [Aboriginal Group] members do not wish to stop all development, but they urge CVRI to protect those resources as much as possible during the development of the area. The water, plants, and animals must be preserved for future generations and the benefit of all people."	July 2008 and August 2011	
				[Individual] expressed that CVRI should compensate the [Aboriginal Group] if there are cumulative effects on water, berries, hunting and fishing.	July 28, 2009	
2	Potential Impact to Treaty or Aboriginal Rights	Hunting	direct impact/removal of hunting locations in Project area	As stated in the TLU report "Another concern of the [Aboriginal Group] was the state of animal resources in the Robb Trend area. The [Aboriginal Group] members do not regularly hunt in this area, preferring to use areas closer to their [Aboriginal Group]. According to the knowledge holders the southern end of the Robb Trend would be a good area for hunting animals such as moose. They also commented on the high number of animal tracks found around the salt-licks observed in the area."	July 2008 and August 2011	<p>CVRI acknowledges that active mining in the Project area will have a direct impact on wildlife, including birds and amphibians, through short to medium-term removal of habitat, fragmentation of habitat, barriers to movement, and possibly direct mortality in some cases (e.g. vehicle collisions etc.). This would have a potential impact on the generalized right to hunt, fish, and trap in these areas during mine development. CR#14 and CR#7 of the Project application detail the proposed mitigation of these effects through the identification of wildlife as a primary end use of the lands, the maintenance of as much undisturbed habitat as possible in the Project area, the revegetation of soil stockpiles to maintain wildlife use, vegetation clearing outside of breeding seasons, buffers along riparian zones, contouring to reduce lines of sight, identification of natural seepages that will become salt/mineral licks after reclamation, hunting restrictions, measures to avoid direct mortality, and a reclamation program that will promote the structural integrity and biodiversity of the landscape to enhance future wildlife use. Tasks that were completed during the wildlife assessment include:</p> <ul style="list-style-type: none"> <li>• identify relative abundance, concentration areas, distribution patterns, and habitat associations of ungulates by means of winter aerial surveys, snow track-counts, and a spring pellet-browse survey;</li> <li>• identify small mammal, avian and amphibian presence, relative abundance and habitat association by means of snow track-counts, trapping small mammals, owl surveys, spring bird survey, breeding bird survey, migration survey, and amphibian survey;</li> <li>• compile a list of vertebrate species (excluding fishes) and identify their status as per the Committee on Endangered Wildlife in Canada (COSEWIC), the Canadian Endangered Species Conservation Council (CESCC 2006) and the General Status of Alberta Wild Species (ASRD 2005);</li> <li>• prepare a habitat map to identify the quantity and quality of habitat present in the Project Development Areas;</li> <li>• update wildlife use of the existing CVM by means of aerial survey, systematic monthly ground surveys, spring pellet-group counts, breeding bird survey and amphibian survey;</li> <li>• identify Valued Environmental Components for assessing the potential impact of the proposed development on ungulates, small mammals, birds and amphibians;</li> <li>• discuss biodiversity at the LSA and RSA scale;</li> <li>• review Traditional Use Studies (TUS) prepared for CVRI from a wildlife perspective;</li> <li>• discuss climate change with respect to changes in the Boreal-Cordilleran ecoregion that may affect wildlife; and</li> <li>• evaluate the potential impacts of the Project within a temporal and spatial perspective that incorporates existing and future demands by other users and developments by conducting a quantitative cumulative effects assessment for elk.</li> </ul> <p>In order to reduce potential impacts to wildlife within the Project area, the following mitigation measures will take place:</p> <ul style="list-style-type: none"> <li>• incorporate select native trees and shrubs such as alder and willow into re-vegetation activities;</li> <li>• maximize downed woody debris (stumps) through direct placement of top-soil and associated slash and stumps;</li> <li>• maintain and connect to core areas as many residual forest patches as possible;</li> <li>• maintain a 30 metre buffer zone of undisturbed natural habitat along well developed riparian corridors, where available;</li> <li>• plant coniferous trees at higher stem densities (&gt;180 stems per acre);</li> <li>• continue to maintain hunting and firearm restrictions on the reclaimed areas of the Project including after mining has ceased and until hiding cover on the mines is equivalent to that of natural closed forest cover types.; and</li> <li>• maintain haul truck and regular vehicle speeds of &lt;70 kph.</li> </ul> <p>In order to evaluate and if need be adapt the mitigation measures, CVRI will also implement monitoring. Site wide monitoring will allow CVRI to determine the length of time it takes for wildlife to return to the landscape and what reclaimed landscape features are most desirable. All potential effects are noted to be reversible over the short-term or long-term depending on the type of effect.</p>
			direct impact/removal of salt/mineral licks (important to game animals) in Project area	As stated in the TLU report "The [Aboriginal Group] knowledge holders identified and were concerned about the future of several licks in the proposed development area."	July 2008 and August 2011	
3	Potential Impact to Treaty or Aboriginal Rights	Trapping	direct impact/removal of trapping locations in Project area	[Aboriginal Group] representatives expressed concern over trapping and trappers rights	February 2, 2009	A total of 22 Registered Fur Management Areas (RFMAs) overlap in whole or in part with the RSA. Fur harvest return information for the period 1985 to 2001 was obtained from Alberta Sustainable Resource Development for the RFMA. Fur returns for 17 different species were reported. This included red squirrel (13,348), muskrat (3,649), beaver (3,401), marten (1,796), weasel spp. (1,531), coyote (896), wolf (236), lynx (133), mink (128), fisher (50), red fox (47), black bear (18), badger (14), striped-skunk (7), wolverine (6), river otter (4) and raccoon (1). The average numbers of captures per year per trap line for Valued Environmental Component (VEC) species were: lynx (0.42), marten (5.17), fisher (0.16), and wolf (0.71). RFMAs 1516, 2619 and 2256 will be directly affected by the proposed development of the Project permit area. Over a 16 year period, RFMA 1516 reported an average number of lynx (0.4/year), fisher (0.19), marten (5.4/year) captures and reported below average wolf captures (0/year). Over a 15 year period, RFMA 2256 reported above average marten (8.5/year), and fisher (0.13) captures and below average lynx (0.3/year) and wolf (0.1/year) captures. Over a 17 year period, RFMA 2619 reported below average capture rates for lynx (0.2/year), marten (1.2), fisher (0.12), and wolf (0.6). Caution must be used when interpreting this data. Capture rates can vary widely and may reflect trapper effort and fur prices as much as it does of animal abundance. Capture rates can also reflect the size of the RFMA. Habitat loss will be short-term as reclamation will target replacing habitat features important in maintaining wildlife populations. Contact and discussions have been held with people holding Registered Fur Management Area rights. Where required, agreements have been reached and compensation provided. Trapping is likely to continue in the RSA. Harvest levels are difficult to predict and are dependant largely on fur prices, RFMA tenure and levels of industrial activity. It is reasonable to assume that future trapping levels will occur at average levels from 1985 to 2001. As noted above, Project development will occur over time, and access to mine areas to undertake Treaty Rights to trap will be restricted in active mining areas for a period of time. However, areas surrounding the Project will still be available to undertake Treaty trapping rights, and Project development and reclamation will be complete by 2060, returning those lands for trapping uses.

L	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
4	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of medicinal plant species in Project area	The [Aboriginal Group] representatives expressed that medicines "are a concern so that they don't lose them, some can't just be transplanted"	September 4, 2007	<p>One of the most common concerns among Aboriginal elders or other users was the impact to medicinal and food plants in the Project area (refer to Table E.12-1 and E.12-2; CR #12, Appendix B and D to G). A number of these plants are thought to be "rare" or "rare elsewhere," whereas others are more common. Often these plants cannot be transplanted due to specific conditions required. Transplanting may, in some cases, impact the potency or efficacy of the medicines. CVRI was asked to use traditional knowledge and native plant species in the reclamation process and will do so. CR #13 (Vegetation) of the Project Application discusses many plants identified to CVRI as important to the Aboriginal community. Aboriginal consultation meetings and field visits conducted by CVRI with First Nations and Aboriginal representatives resulted in the identification of a list of vegetation species which are valued by the Aboriginal groups for their uses. The field surveys identified 88 TEK vegetation species which occur in the LSA (CR # 13, Appendix 5). Of the TEK vegetation species documented during field surveys, 8 are typically used for critical medicinal purposes, 20 are used for food, and 60 are used for other purposes. None of the TEK vegetation species are on Alberta's 2011 Tracking and Watch List, used to identify species that are rare or otherwise special in some way. TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions (CR # 13, Table 4.7). These occurrences have been mapped and documented to identify species that are within the LSA and within the Project Footprint. In total 2,264.9 ha of ecosite phases with very high potential to support TEK vegetation will be removed by the Project Footprint, this area encompasses 22.4% of the very high potential area in the LSA. As well, in total 1,354.1 ha of ecosite phases with high potential to support TEK vegetation will be removed by the Project Footprint, high potential area encompasses 13.4% of the high potential area in the LSA. Fifty-four percent (5,467.0 ha) of areas which support TEK vegetation will be removed from the LSA by the Project Footprint. However, TEK vegetation Project effects at the LSA level do not necessarily lessen the accessibility of TEK vegetation for Aboriginal groups given that TEK vegetation is available in the RSA and region. The distribution of ecosite phases which support TEK vegetation will be accessible in the RSA following removal of ecosite phases by the Project Footprint in the LSA. It is assumed that ecosite phases within the LSA are similar in composition and distribution as those in the RSA; consequently, TEK vegetation will still be accessible in the RSA. Mitigation measures for TEK vegetation effects should include but will not be limited to the following:</p> <ul style="list-style-type: none"> <li>• inviting Aboriginal groups to participate in designing mitigation measures which contribute to the sustainable management of TEK vegetation, and which compliment the re-vegetation measures proposed in the Application;</li> <li>• working with Aboriginal groups, who may be affected by the Project, to locate alternative areas where TEK vegetation is accessible during the life of the Project; and,</li> <li>• implementing a re-vegetation program which aims at the re-establishment of ecosites common to the pre-disturbed landscape. The re-establishment of pre-disturbance ecosites will, over time, again support TEK vegetation.</li> </ul> <p>With the implementation of mitigation measures the Project is expected to have a limited spatial effect, and a moderate temporal effect. Potential Project effects are related to the attenuation of available TEK vegetation (vegetation used for medicinal, food and other uses) as a result of the removal of ecosite phases within the LSA. CVRI is committed to working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation. Accordingly, it is anticipated that the Planned Project effects on TEK vegetation will be local in extent and over the long term, all areas used for harvesting TEK vegetation will be re-established. CVRI will continue the consultation with the Aboriginal groups as information is brought forward regarding specific impacts to traditional uses as well as undertake further discussions with Aboriginal groups on specific impacts and mitigation measures. Negotiations with Aboriginal groups will also continue on a case by case basis for avoidance of specific plant species if possible. Not all of the Project area will be disturbed at one time. CVRI can work with local Aboriginal groups to identify periods of time in certain locations (undisturbed by mining and safe to access) in which berry picking and medicinal plant gathering can occur.</p>
			removal of medicinal plant species in Project area	During the 2008 and 2011 Robb Trend TLU studies the [Aboriginal Group] identified several medicinal plant species in the Project area	July 2008 and August 2011	
			removal of ceremonial plant species or resources in Project area	Potential ceremonial and important plants identified during field studies	July 2008 and August 2011	
			removal of food plant species in Project area	[Aboriginal Group] representatives stated that there is less and less access to resources all over, including berries, even for people from Robb and this is one of the area you can still get berries without competing with the bears	February 2, 2009	
			removal of food plant species in Project area	[Aboriginal Group] representatives identified several food plant species in the Project area	July 2008 and August 2011	
5	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	reclamation	[Individual] expressed that the [Aboriginal Group] would to be involved in reclamation	February 2, 2009	TEK vegetation have a very high potential to occur in ecosite phase d1, e2, e3 and i1 and a high potential to occur in c3, e1 and j1 in the Foothills Natural Sub-regions. These ecosites will be targeted in the reclamation process in order to provide the traditional knowledge and native plant species an environment suitable for survival. CVRI is committed to working with Aboriginal groups to design and implement re-vegetation programs that target and support TEK vegetation.
6	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	removal of other harvestable resources in Project area	Other traditional use resources were identified in the Project Area.	July 2008 and August 2011	Consultation efforts with Aboriginal Group L have included the collection of traditional ecological knowledge data from the community regarding proposed CVRI extension areas including the Robb Trend. During these studies, the community did not identify any sites specifically used by community members to exercise Treaty Rights and traditional uses in the Project area, but did identify many of the type of resources traditionally used by community members for various purposes. CVRI will use the traditional knowledge to help plan reclamation strategies to return to land to a more useable state for the exercise of Treaty Rights and traditional uses following mining.
7	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	general impacts to water quality in Project area	[Individual] expressed that the biggest concern for the [Aboriginal Group] would be water quality	June 27, 2007	<p>The CVM will be implementing a surface water management plan throughout the life of the Project. This plan includes the collection and treatment of mine affected water. All water affected by mining (sediment filled) will be treated in settling ponds prior to being released to the adjacent environment. Released water will comply with the approval conditions. No significant water quality changes are expected and water quality in the end pit lakes will likely be suitable for aquatic life. Potential changes in surface water quality in the RSA were assessed as insignificant (Section E.11, CR# 11).</p> <p>Within the Hydrology and Surface Water Quality reports in the Application, a number of monitoring programs are listed including:</p> <ul style="list-style-type: none"> <li>• continue monitoring programs already in place at the existing CVM mine (i.e., flow and TSS at settling ponds, regular inspections of all drainage works, and upstream and downstream water quality sampling);</li> <li>• document the effect of mine operations on long term flow regimes in order to document critical low flow conditions during pit filling periods and define the need for any bypass pumping to maintain in-stream flows;</li> <li>• establish flow monitoring stations 2-3 years in advance of commencement of Project operations in each watershed;</li> <li>• conduct periodic runoff and drainage control monitoring (adjust the capacity of or relocate sump systems and drainage works as mining proceeds);</li> <li>• conduct ongoing monitoring, operations, and maintenance as outlined in the water management plan with periodic reviews and adjustments;</li> <li>• monitor adjacent undisturbed areas to ensure surface runoff from disturbed areas does not occur; and</li> <li>• monitor surface water quality in natural watercourses, both upstream and downstream of Project activities as required in the EPEA approval.</li> </ul> <p>Through these measures and others CVM will continue to safeguard water quality in the region from potential impacts from the Project.</p>
				[Aboriginal Group] representatives expressed concern over water quality	February 2, 2009	
				[Aboriginal Group] representatives discussed concern of water quality and cumulative effects on water	July 28, 2009	
				Based on the TLU studies "The knowledge holders were concerned with water quality in the area and how future development programs will impact these resources. They note that the streams by their [Aboriginal Group] are among some of the only good sources of water left."	July 2008 and August 2011	
8	Potential Impact to Treaty or Aboriginal Rights	Important Animals	displacement of bears from Project area	As stated in the TLU report "As with other aboriginal groups, the [Aboriginal Group] hold a particular place of reverence and respect for bears, and the impacts of this project and others on bear populations is a concern."	July 2008 and August 2011	<p>Grizzly bears will likely be displaced from portions of the Project mine footprint and permit area during the active mining period. Displacement will result from construction noise and blasting. At some point shortly after reclamation grizzly bears will be attracted to the herbaceous forage and ungulates on the Project mine footprint as was observed on the Luscar, Gregg River and CVM reclaimed mine areas. The mined lands will not act as a serious barrier to grizzly bears, with the possible exception of during active blasting and hauling. In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. The greatest threat to regional grizzly bear populations is human-caused mortality caused by legal and illegal hunting, self-defence kills by ungulate hunters, and vehicle/train collisions. Any land use that results in increased access or use of access by individuals carrying firearms is a threat to grizzly bear population persistence. Any roads with vehicle speeds greater than 70 kph also have potential to result in increased grizzly bear mortality. Sources of domestic garbage at the CVM are contained in appropriate secure containers and transported to the licensed landfill in Hinton as per the Approval conditions. Problem bear actions at mines in the Coal Branch region are of extremely limited occurrence.</p> <p>Grizzly bears actively select habitats and foods that provide them with the greatest possible net digestible energy (Hamer and Herrero 1983, Pritchard and Robbins 1989). Mining and subsequent reclamation of the existing CVM has significantly changed landscape structure, composition and food production in the permit area for grizzly bears. Mining and reclamation at the CVM has resulted in removal of tree canopies, leading to increases in availability of high energy herbaceous plant material (clover, thistles, legumes) and an increase in ungulates (elk, deer) responding to increased forage and edge habitat. There is strong evidence to suggest that ungulates and plants used for reclamation are sought and used extensively by grizzly bears occurring in the vicinity of the CVM area. Similar findings were observed in the existing Luscar and Gregg River mines (Stevens and Duval 2005; Kansas and Symbaluk 2011). Bears using the reclaimed Luscar and Gregg River mine lands were on average larger than bears in an adjacent un-mined Subalpine and the Gregg/Luscar permit block was considered to be an attractive habitat for grizzly bears and a source for enhanced cub production (Kansas 2005). If similar reclamation measures are used on the Project then impacts on grizzly bears from a habitat alteration perspective will likely be positive within 10 years post-construction.</p> <p>In the case of regional and cumulative grizzly bear mortality, the proposed Project is unlikely to add significantly to regional mortality. This assertion is based on the fact that carrying of firearms is not permitted within any mine permit areas and traffic speed control is practiced. It is further supported by the fact that no grizzly bear mortalities have occurred on mine permit areas in 40+ years in the Coal Branch region (Symbaluk 2008). This does not diminish the seriousness of cumulative effects on grizzly bear mortality in the RSA and broader Yellowhead region.</p>

L	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
9	Potential Impact to Treaty or Aboriginal Rights	Health	blasting	[Aboriginal Group] representative stated "once in a while we hear a blast, how often do those go off? we even feel them sometimes"	February 2, 2009	Blasting will be conducted on weekday afternoons and the utilization of smaller more localized blasts will be implemented to reduce noise levels and the amount of explosive being used. Depending on the geological formation and the associated mine plan blasting can occur once a week.
10	Potential Impact to Treaty or Aboriginal Rights	Health	general impacts to animal health quality in surrounding region	[Individual] expressed that one of the biggest concerns for the [Aboriginal Group] would be sick game	June 27, 2007	Through its consultation efforts, CVRI is aware that many Aboriginal groups are concerned about the effect of industrial development on wildlife health. They report cases of diseased animals that when butchered are found unfit for consumption, and many attribute this to industrial development. This has even led to research studies into animal health supported by several Treaty 6 First Nations. And of course, Alberta Fish & Wildlife (AESRD) studies numerous animal health issues including Chronic Wasting Disease (CWD), White-nose Syndrome, West Nile Virus, mammalian skin tumours, and numerous others. They have established programs to track, understand, and manage many of these. CVRI recommends that Aboriginal groups continue to press the Provincial Crown and other industrial players on the potential link between industrial activities and animal health. As for Robb Trend Project potential effects on animal health, a discussion of these is found in CR#5, Human Health, Appendix F: Screening Level Wildlife Risk Assessment (SLWRA). This assessment looked at any potentially harmful substances that could be associated with the Project such as air contaminants, heavy metals, polycyclic aromatic hydrocarbons, volatile organic compounds, and others that could be released into the air, or otherwise make their way into soils or surface water, and then be breathed in or eaten by animals. In order to err on the side of caution, the study assumed that potentially affected animals would be exposed to maximum potential adverse effects from the air for their entire life cycle, and that the Project would last 80 years instead of 25. The assessment concluded that predicted acute exposures to the substances through the air would not have an adverse effect on either avian or mammalian wildlife in the region. It was also concluded that predicted chronic exposures to the substances through the air would not have an adverse effect on mammalian wildlife in the region. Most predicted soil concentrations for these substances are not expected to have an adverse effect on wildlife populations in the study area. However, some metals identified during the screening indicated a possible concern under only one of the several screening guidelines, and resulted in more in-depth analysis. This analysis indicated that these metals will be within the typical range of levels across Alberta, and therefore comparison of predicted soil concentrations to background levels indicated that wildlife are not likely to be at any greater risk in the RSA than other populations across Canada. In all instances, the long-term surface water concentrations of the substances are not anticipated to adversely affect wildlife populations in the region. The results of the SLWRA indicate that the overall risks posed to wildlife health from the Project will be low. Therefore, no impacts to wildlife populations are expected based on estimated wildlife exposures to predicted maximum acute and chronic air concentrations and measured soil and surface water concentrations. The confidence in the prediction is high since highly conservative assumptions were applied in the SLWRA. CVRI will continue to work with government agencies, Aboriginal groups, and others to monitor and mitigate against potential effects to animal health in the region.
11	Potential Impact to Treaty or Aboriginal Rights	Hunting	loss of access to additional land for hunting in general region	[Aboriginal Group] representatives expressed that there has been conflict in hunting areas in the past, and asked if there could be an agreement to harvest some wildlife and because it was a diminishing area there may be need to talk about compensation if area gets too small	February 2, 2009	CVRI will not be offering compensation in the forms of payments or royalties to any Aboriginal group for any direct effects of the Project or for any regional cumulative effects. On January 31, 2010, Aboriginal Group L leadership entered into a written agreement, in part providing community approval for the development of the Robb Trend. This agreement is a recognition by both parties that potential project benefits to the community in the form of employment or community support represent adequate mitigation of the potential loss of this area for undertaking traditional pursuits for the duration of mining activities and prior to adequate reclamation. Through this agreement CVRI continues to consult with Aboriginal Group L regarding its operations, and continues to work with the community on support initiatives including education and employment for the duration of the development of the Project as specified in the agreement. In addition, as noted above, not all of the Project area will be disturbed at one time. CVRI can work with local Aboriginal groups to identify periods of time in certain locations (undisturbed by mining and safe to access) in which berry picking and medicinal plant gathering can occur. Hunting within the mine permit boundary cannot occur as carrying firearms within the permit boundary is restricted for safety reasons.
12	Potential Impact to Treaty or Aboriginal Rights	Traditional Use	Traditional Use Studies	[Individual] expressed potential interest in TUS studies	October 3, 2006	CVRI has been consulting with Aboriginal Group L about the Robb Trend Project and potential impacts since 2006. These efforts included the collection of traditional ecological knowledge data through traditional use studies from the community regarding proposed CVRI extension areas including the Robb Trend, with capacity funding provided by CVRI. CVRI will use this information to help plan reclamation strategies to return to land to a more useable state for the exercise of Treaty Rights and traditional uses following mining.
				[Aboriginal Group] expressed interest in conducting TUS studies to access plant use	September 4, 2007	
				[Aboriginal Group] expressed that although they didn't really use the CVRI expansion areas for hunting and plant collecting, there still could be plants there that they could use and would like to conduct TUS studies	September 10, 2007	
				Interest expressed in additional TLU studies for changes to Robb Trend project footprint	April 27, 2011	
				[Individual] expressed that he would like CVRI to acknowledge [Leader] for his additional work on the TLU studies	June 6, 2011	
13	Potential Impact to Treaty or Aboriginal Right	Consultation	Consultation	[Individual] expressed that the [Aboriginal Group] would like independent consultation and this is supported by their new school	June 27, 2007	CVRI has engaged in consultation with Aboriginal Group L on its proposed development projects including the Robb Trend since 2006. A written agreement is currently in place between the parties supporting continued engagement of mutual benefit and understanding to both parties. CVRI will continue to consult directly with Aboriginal Group L on the Robb Trend, its operations, and other matters of importance to the community in the future, unless and until such time as Aboriginal Group L indicates its desire to modify this situation.
				The [Aboriginal Group] expressed they would like their own independent TLU studies without [other Aboriginal Group] involvement	September 4, 2007	
				[Individual] stated that the [Aboriginal Group] would not like consultation through [other Aboriginal Group] and [Individual].	August 22, 2011	
				[Aboriginal Group] representatives discussed consultation on their own behalf independent of [other Aboriginal Group]	January 30, 2012	
				[Individual] discussed independent consultation from [other Aboriginal Group] for the [Aboriginal Group]	February 28, 2012	
				[Individual] reiterated the [Aboriginal Group] position that they will consult on their own behalf not through [other Aboriginal Group]	May 2, 2012	
				[Aboriginal Group] representatives discussed their concern of independence from [other Aboriginal Group]	October 4, 2012	

L	Concern Raised by Aboriginal Group	Potentially Affected Right or Use	Potential Effect	Stated Concern	Date Concern Raised	Proposed Proponent Mitigation, Accommodation, or Response
14	Employment Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	[Individual] inquired about job opportunities	October 3, 2006	CVRI has indicated to Aboriginal Group L its willingness to hold some type of employment information session with the community. This event will help members understand how to seek employment at the mine, what types of positions and skills are required, and may help motivate students in finishing their formal education and choosing their career paths. The parties have yet to determine an appropriate date for such an event, but will continue to discuss the issue. Currently, there are three members of Aboriginal Group L who have jobs at the Coal Valley Mine.
				Interest expressed in jobs for community by [Aboriginal Group] representatives	February 2, 2009	
				[Aboriginal Group] representatives expressed interest in job opportunities and job fair/open house at the community	July 28, 2009	
				[Aboriginal Group] representatives expressed interest in employment, summer student positions and hosting a "job fair" at the community	November 27, 2012	
15	Training Opportunities	Socio-economic development	increased employment for underemployed sector of Aboriginal society	Interest expressed in training and generating income for their people	July 28, 2009	CVRI has a hiring policy open to anyone with suitable qualifications. This policy has been provided to Aboriginal groups. CVRI has offered to communicate job posting with Aboriginal employment officers.
				[Aboriginal Group] representatives expressed interest in job training, and [Individual] requested initiation of training program for vocations	November 27, 2012	
16	Education Support	Socio-economic development	supporting children's education; increased employment for underemployed sector of Aboriginal society	Interest expressed in funding towards education	July 28, 2009	On January 31, 2010, Aboriginal Group L leadership entered into a written agreement, in part providing community approval for the development of the Robb Trend. This agreement is a recognition by both parties that potential project benefits to the community in the form of employment or community support represent adequate mitigation of the potential loss of this area for undertaking traditional pursuits for the duration of mining activities and prior to adequate reclamation. Through this agreement CVRI continues to consult with Aboriginal Group L regarding its operations, and continues to work with the community on support initiatives including education and employment for the duration of the development of the Project as specified in the agreement. Support for the community's school is an element included within the agreement. CVRI and Sherritt are in the process of developing a corporate Aboriginal consultation plan. One of the items under a consideration is a scholarship or bursary program designed to help Aboriginal students fund continuing education.
				Discussion of interest in funding for school	October 29, 2009	
				[Aboriginal Group] representatives expressed interest in summer student positions	November 27, 2012	
17	Contracting Opportunities	Socio-economic development	development of Aboriginal owned business; increased employment for underemployed sector of Aboriginal society	[Aboriginal Group] representatives expressed interest in contracting opportunities	July 28, 2009	CVRI has a procurement policy open to any business which provides competitive services. This policy has been provided to Aboriginal groups. CVRI has offered to receive and review available Aboriginal business proposals.
18	General Community Support	Community Development	enhance Aboriginal social programs and services	[Aboriginal Group] representatives inquired about CVRI helping with their society Ex. transportation as they have none in their area	February 2, 2009	CVRI has helped the Aboriginal Group L community in the past by delivering loads of wood for use in the community, and has recently provided funding to help with the purchase of equipment needed to help maintain the rink. CVRI is in discussions with other companies and Aboriginal Group L regarding improving its water supply. As on a number of occasions in the past, CVRI will continue to support Aboriginal Group L community programs through donations on an ad hoc basis. As part of the development of a corporate Aboriginal consultation plan at CVRI and Sherritt, the formalization of such a funding program is one of the items under consideration.
				Interest was expressed for donations (ice rink, summer jobs for high school, ceremonies, pow-wow)	February 2, 2009	
				[Aboriginal Group] representatives expressed interest in getting wood from the cut trees and dirt from the mine	February 2, 2009	
				funding for cultural camp	July 28, 2009	
				Interest expressed in funding for firewood	July 28, 2009	
				Request for additional loads of wood	October 9, 2009	
				Discussion of interest in funding for a van for and firewood	October 29, 2009	
				Discussion of interest in community support	October 4, 2012	

**Coal Valley Resources Inc.**  
**Robb Trend Project**  
**ABORIGINAL CONSULTATION PLAN**  
**February 11, 2011**

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## 1. INTRODUCTION

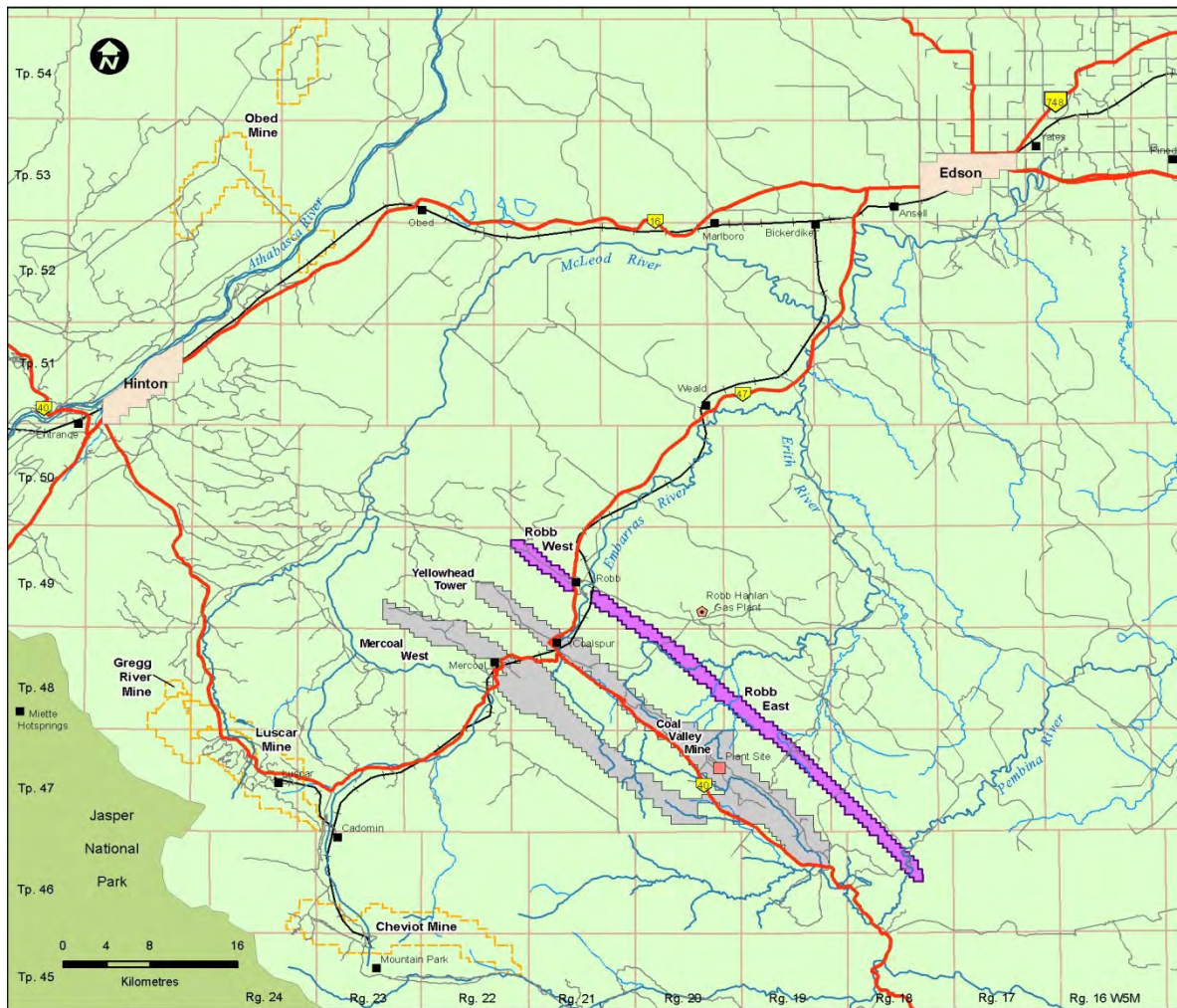
The Coal Valley Mine (CVM), owned by Coal Valley Resources Inc. (CVRI), is located 90 km south of Edson and has operated since 1978. The company, subject to meeting Alberta's regulatory requirements, intends to proceed with an application for mining in the Robb Trend Project, adjacent to the existing CVM operations (Figure 1). The area is within Categories 3 and 4 lands in the eastern portions of the Eastern Slopes Region that are suitable for coal exploration and development. Given the proximity of the Robb Trend Project to two other extension areas, Mercoal West and Yellowhead Tower, CVRI has employed a coordinated approach to consultation and traditional use studies of all three. All work done to date has been under a coordinated consultation plan submitted previously and approved for the Mercoal West and Yellowhead Tower projects. Approval for the Mercoal West and Yellowhead Tower projects has been granted. The Robb Trend Project application is in development and is scheduled for submission in 2011. Robb Trend Project aboriginal consultation is on-going, and will require some additional traditional use studies given recent modifications to the proposed lease area.

First Nations people, or those of aboriginal heritage, and their ancestors have made use of this Foothills area of Alberta for the last 10,000 years. Under Treaty with the Crown and the Government of Canada, these First Nations' uses were enshrined as the right to collect, hunt, fish, and trap for food on Crown land, as well as other traditional uses such as ceremonies and burials. Based on recent Supreme Court decisions, before certain developments may proceed in Alberta, proponents must ensure that consultation is undertaken with First Nations groups on lands where existing Treaty or constitutional rights may be infringed by development activities. First Nations groups view the treaties as inviolable, and take the rights described therein very seriously. The government and developers are expected to fairly and reasonably treat the concerns raised by First Nations during the consultation process.

Commitments made during earlier CVRI consultation programs to ensure potentially affected aboriginal community representatives were kept up-to-date on mine development activities have been honoured through tours of current mine operations and of potential extension areas. This has usually included the Alexis First Nation, Jimmy O'Chiese and the Foothills Ojibway Society (FOS), and the Nakcowinewak Nation of Canada (NNC). During the most recent consultation program for the Mercoal West and Yellowhead Tower extensions efforts have also included the Paul, Sunchild, and O'Chiese First Nations, the Mountain Cree (Smallboy) Camp, the Aseniwuche Winewak Nation (AWN), and the Métis Nation of Alberta (MNA).

As part of the current Environmental Assessment (EA) process for the proposed Robb Trend Project, communities have been and will be encouraged to undertake Traditional Use Studies (TUS) of the extension area to help gauge the effect of the development on members of the community. The consultation and studies for the Robb Trend Project were first entered into in accordance with the *Government of Alberta's First Nations Consultation Policy on Land Management and Resource Development* released in September 2006. The guidelines that support the policy, now known as *The Government of Alberta's First Nations Consultation Guidelines on Land Management and Resource Development*, are a recognition that the Province of Alberta must consult with First Nations where land development activities may adversely affect First Nations rights and traditional uses of Crown lands (Government of Alberta November 2007). Alberta has delegated portions of this consultation process to industry, including notification to band councils or designates of developments and their potential adverse effects, meetings to discuss ideas, comments, and concerns of the potentially affected First Nations, and the development of strategies to avoid or mitigate adverse effects. The Robb Trend Project

Figure 1: Robb Trend Project Location



consultation program will also incorporate directives from the Canadian Environmental Assessment Agency or other Federal government agencies on aboriginal consultation when and where required.

## **1.1 Aboriginal Consultation and Traditional Use Studies**

Traditional Use Studies (TUS) are an important part of the consultation process. These are often also referred to as Traditional Land Use (TLU) studies, or studies of Traditional Ecological Knowledge (TEK). These studies seek to gauge the extent of past and present use of the land for traditional pursuits important to First Nations and other aboriginal peoples including, but not limited to, hunting, fishing, trapping, collection of plants including berries and herbal medicines, and ceremonial pursuits<sup>1</sup>. The collection of this data is typically through informant interview of Elders or other community members, and field visits to areas where specific information from oral sources is recorded. These studies not only provide information relevant to gauge the use of the area, but also help to preserve the cultural patrimony of potentially affected aboriginal groups, and help the young learn from the collective knowledge of the community. Traditional Use Studies with First Nations have occurred in Alberta for many years, but in late 2006 the process became more formalized with the official release of the new policy and guidelines.

The guidelines have altered the form of consultations and TUS studies in the Province, as most First Nations develop their own traditional use studies programs. In some cases the Province has provided capacity funding for the development of TUS programs at First Nations, and in other cases industry or non-governmental organizations have provided the capacity funding. Because traditional use information is often sensitive and important to the First Nation or even particular families or individuals only, many First Nations groups have or will do the necessary field studies and reporting on their own. They will provide CVRI and the Government of Alberta with only that information necessary to ensure that very important areas or locations are not affected by development. This allows the groups to maintain control over their own cultural knowledge and heritage. Some groups have their data maintained by the Foothills Research Institute, others have data sharing agreements with Alberta Culture and Community Spirit (ACCS), and others will maintain their own data. The government foresees a time when they will maintain a comprehensive database of traditional use across the Province, however, at this point there is neither the capacity nor the will among stakeholders to see this in place.

## **1.2 Robb Trend Project Aboriginal Consultation to Date**

CVRI has been engaged in consultation and traditional use studies of the Robb Trend Project area with potentially affected First Nations groups for approximately four years. The First Nations Consultation Plan for the proposed CVM extensions (including Mercoal West, Yellowhead Tower, and Robb Trend Projects) was first proposed on June 5, 2006, and was finalized after a meeting and discussion with Alberta Environment on August 17, 2006. The Terms of Reference for the Mercoal West and Yellowhead Tower projects were finalized on May 29, 2007. CVRI has updated Alberta Environment bi-monthly since July, 2007 regarding the status of First Nations consultation and traditional use studies of the proposed extension areas, including the proposed Robb Trend Project. This consultation plan will supplement and supersede that earlier program, but will continue in the same spirit of consultation.

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<sup>1</sup> Freeman 1992; Honda-McNeil and Parsons 2003; McKillop 2002; and Parker and King 1990 - definitions of TUS studies, their methodologies, complexities, and implications



Traditional Use Studies have largely been undertaken for the Robb Trend Project area, although some work and reporting remain to be completed by participating First Nations groups. Recent modifications to the proposed lease area may require additional TUS on behalf of some potentially affected groups. Given the relatively small geographic scale of the work, these studies must ultimately be viewed as collections of “base-line” data regarding First Nations traditional use of the specific development areas.

## **2. POTENTIALLY AFFECTED ABORIGINAL GROUPS AND CONSULTATION PLAN**

A number of First Nations have used the Coal Valley area historically and traditionally, continuing to this day. Many of these groups have strong social and blood ties with one another. In order to identify potentially affected First Nations groups, a draft version of the CVRI “Aboriginal Consultation Program” for Mercoal West, Yellowhead Tower, and Robb Trend extensions was produced on June 6, 2006 and forwarded to the staff of Alberta Environment for review and discussion. At a June 19, 2006 meeting between representatives of CVRI and Cindy Elliot, Manager, Aboriginal Relations, Central Region for Alberta Environment (AENV), the CVRI First Nations consultation program was discussed and a list of eight potentially affected aboriginal groups was established. CVRI consultations with aboriginal groups have extended above and beyond the five First Nations groups required by Alberta Environment at that time to include three non-Treaty groups. Consultations were not to be limited to Treaty First Nations groups, as the area has also been used considerably by several non-Treaty aboriginal groups in the region. It was agreed that CVRI would be responsible for providing capacity funding to those First Nations with rights and traditional uses in the area in order for effective consultation and traditional use studies to occur, and that CVRI would update AENV on a bi-monthly basis regarding the progress of the consultation program. Based on this program, consultation and TUS studies were initiated in late July 2006 when information about the proposed mine extensions was sent to each potentially affected group.

Consultations and TUS studies were initiated with several Treaty 6 First Nations, including the Alexis First Nation, Paul First Nation, O’Chiese First Nation, and Sunchild First Nation. In addition, several societies representing non-treaty First Nations in the area have been consulted, including the Foothills Ojibway Society, Nakcowinewak Nation, Aseniwuche Winewak Nation of Canada, and the Mountain Cree (Smallboy) Camp (officially members of the Ermineskin Cree First Nation). The formal process of consultation with potentially affected members of the Métis community was initiated in July 2008 and is on-going.

Alberta’s First Nations Consultation Policy and Guidelines require consultation with potentially affected First Nations, and do not apply to Métis or other aboriginal communities. Alberta Environment understands that a Proponent may include Métis and other Aboriginal groups in an effort to be inclusive in consultation efforts and practice a “good neighbour” approach. At this time, Alberta does not have information that would support a requirement for consultation with Métis communities.

CVRI will be engaging Métis groups, the Nakcowinewak Nation of Canada, and the Foothills Ojibway Society as part of its good neighbour practices. CVRI has been advised to notify Alberta Environment of any assertions or concerns raised by Métis groups, the Nakcowinewak, or Foothills Ojibway during engagement and throughout the regulatory process. Alberta Environment may require CVRI to

undertake further consultation based on the receipt of new or additional information at any time during the regulatory approval process.

CVRI will continue to consult with this same set of aboriginal groups for the proposed Robb Trend Project. Information related to the proposed consultation program with Métis, Nakcowinewak, and Foothills Ojibway is found in Appendix A: *Métis, Nakcowinewak, and Foothills Ojibway Engagement Plan*. Primary contacts for the First Nations communities are listed in Table 1 below.

**Table 1: Potentially Affected Aboriginal Communities**

<b>Aboriginal Group</b>	<b>Primary Contacts</b>	<b>Contact Information</b>
Alexis Nakota Sioux Nation	Orlando Alexis Rhonda Alexis (official CVRI Liason)	Box 7 Glensville, AB T0E 0X0 phone 780-967-3573 fax 780-967-5484
Aseniwuche Winewak Nation	Marc Levasseur Shirley Delorme	Box 1808 10020 99th St. Grande Cache, AB T0E 0Y0 phone 780-827-5510 fax 780-827-4788
O'Chiese First Nation	Frida Chippeway Cheyenne Yellowface Lester Yellowface	P.O. Box 1570 Rocky Mountain House, AB T4T 1B2 phone 403-989-2297 fax 403-989-3795
Paul First Nation	Dennis Paul	P.O. Box 89 Duffield, AB T0E 0N0 phone 780-892-2691 fax 780-892-3402
Mountain Cree (Smallboy) Camp	Wayne Roan Reinhart Roan	P.O. Box 762 Hobbema, AB T0C 1N0 phone 780-312-3099
Sunchild First Nation	Edwin Frencheater	P.O. Box 747 Rocky Mountain House, AB T4T 1A5 phone 403-989-3740 fax 403-989-2533

The aboriginal consultation program for the Robb Trend Project had been undertaken in conjunction with the Mine extension program launched in 2006. With the exception of the Sunchild First Nation, those studies are substantially complete. Consultation and TUS work, as outlined in agreements between CVRI and specific aboriginal groups, is ongoing. The minor adjustment to the area encompassed by the Robb Trend Project application has resulted in the necessity of new aboriginal TUS

work and support documents to completely satisfy the aboriginal consultation obligation for the Robb Trend Project application.

A new notification package will be produced to advise those groups of the additions to the Robb Trend Project area. Bi-monthly reporting to Alberta Environment will continue as previously. CVRI assumes this bi-monthly reporting will continue for eight months after the project application in December 2011. Given that past consultation activities and current agreements and relationships vary considerably from group to group, a “one size fits all” approach will not be feasible. Instead, the CVRI consultation team will reference past activities and agreements to create an approach that will most effectively and suitably complete traditional use studies and consultation activities in a suitable manner.

The history of consultation with each group on the Robb Trend Project and current status of the relationship between CVRI and the group is briefly outlined below.

### **ALEXIS FIRST NATION**

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CVRI and the Alexis First Nation have entered into a long-term agreement as a result of the previous consultation efforts. Among other things, the agreement has established a liaison between the parties that should facilitate consultation activities and traditional use studies considerably for the Robb Trend Project. The Alexis First Nation undertook traditional use studies of the proposed extensions including the Robb Trend Project, and will likely wish to supplement some of the information acquired during the first set of work in the new areas.

### **ASENIWUCHE WINEWAK (AWN)**

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During previous Coal Valley Mine extension consultation, AWN indicated that these areas are considered just outside of their traditional territory, and would not affect their traditional uses. They indicated that further extensions to the northwest may enter this territory, and have requested to be consulted in that case. AWN will be consulted, but we anticipate their findings will be the same as for the previous extension areas. If they find this area is inside their territory, we anticipate traditional use studies will be required.

## **MOUNTAIN CREE (SMALLBOY)**

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Mountain Cree traditional use studies of the three earlier extension areas (including the Robb Trend Project) were undertaken with the assistance of Lifeways of Canada. Currently an agreement is in place between CVRI and the Mountain Cree regarding the extensions. CVRI still has to conduct an open house in the community to discuss, among other issues, employment opportunities at CVM. The current relationship between CVRI and the Mountain Cree is good, and the existing ties will facilitate consultation regarding the additional areas of the Robb Trend Project. The Mountain Cree may wish to undertake traditional use studies of the new area.

## **O'CHIESE FIRST NATION**

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O'Chiese First Nation traditional use studies and consultation efforts for the extension projects (including the Robb Trend Project) were done in tandem with the Nakcowinewak. Currently CVRI has an agreement with these groups that has avoided traditional use areas within the Robb Trend extension deemed most significant, and provides for long-term consultation and remediation activities using aboriginal knowledge pertaining to medicinal plants in the area. CVRI has a good relationship with the consultation and traditional use groups at O'Chiese. The current relationship should greatly facilitate consultation work for the additional areas. We expect that the O'Chiese First Nation will wish to undertake traditional use studies of the added areas within Robb Trend Project.

## **PAUL FIRST NATION**

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CVRI has a good relationship with the Paul First Nation stemming from the earlier consultation activities and traditional uses studies of the extensions including the Robb Trend Project. This will facilitate future consultation efforts. Paul undertook traditional use studies of the three previous extension areas. As with the earlier program, Paul will likely undertake additional traditional use studies of the new areas as part of the greater consultation for the Robb Trend Project.

## **SUNCHILD FIRST NATION**

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Sunchild First Nation undertook traditional use studies of the three earlier extension areas including the Robb Trend Project, but failed to provide reports to CVRI. CVRI will continue to consult with the

Sunchild First Nation and engage the Nation in any additional traditional use studies or other consultation efforts required for the new areas within the Robb Trend Project.

### **3. PROPOSED ACTIVITIES AND SCHEDULE**

CVRI representatives will directly and actively notify the First Nations communities identified with detail on the nature of the project proposed Robb Trend extension with sufficient detail that the communities can understand the extent and scope, and any changes relative to the project area as previously consulted on. Anticipated forms of communication may include face-to-face meetings between CVRI representatives and aboriginal community leaders, open houses in communities to introduce or re-introduce the Robb Trend Project and gather community feedback, regular mailed updates on project development and scheduling, tours of current mining operations and the proposed Robb Trend Project area, and community traditional use studies and resultant reports providing information on potential effects. Other forms of communication and information sharing will be developed and engaged where appropriate.

- CVRI representatives will continue to engage the aboriginal communities on all extension plans as outlined in agreements previously concluded with those groups.
- CVRI representatives will make contact with the eight Aboriginal community representatives and arrange meetings during December 2010 and January 2011 and following to formally introduce them to the modifications to the Robb Trend Project footprint.
- From the initial meeting, the preferred methods of involvement, contact and information sharing will be determined, and a schedule for regular project updates and comments from community representatives will be set.
- CVRI project leaders will ensure that methods are used to inform the membership of each of the communities of the project and their opportunity to be part of the consultation process; in part current community familiarity with the projects will help ensure that notification goes beyond Chief and Council. The Plain Language notification that will form part of the notification process is attached as Appendix B.
- Once approved, CVRI will share this aboriginal consultation plan with the potentially affected groups.
- As with past consultation efforts for the Robb Trend Project the company will assist the various aboriginal communities who identify a direct traditional use interest in the area that may be affected by mining development in building capacity to be part of the consultation process.
- CVRI will provide on-going project summary information through direct mail of a newsletter to introduce the expansion project, requirements, public involvement initiatives, company contact information as well as an issues response form as part of the overall project information and public involvement program.
- CVRI will share bi-monthly update reports to Alberta Environment on the status of consultation efforts with the potentially affected aboriginal groups.

#### **3.1 EIA Terms of Reference**

Other activities and reporting efforts associated with aboriginal consultation for the Robb Trend Project will conform to the requirements of the EIA Terms of Reference for the project. The EIA Terms of

Reference specific to the Robb Trend Project have not been finalized, but are expected to reflect previous Terms of Reference for the Environmental Assessment Program for coal mines and the Proposed Terms of Reference for the Robb Trend Project. Sections of the Proposed Terms of Reference for the Project most directly relevant to aboriginal consultation include:

### **PUBLIC ENGAGEMENT AND ABORIGINAL CONSULTATION**

- Document the public engagement program implemented for the Project including:
  - a list of all meetings and the specific comments or issues raised at the meetings;
  - description and documentation of concerns and issues expressed by the public, the Proponent’s analysis of those concerns and issues, and the actions taken to address those concerns and issues; and
  - how public input was incorporated into the Project development, impact mitigation and monitoring.
- Document the aboriginal consultation program implemented for the Project including:
  - a list of all meetings and the specific comments or issues raised at the meetings;
  - description and documentation of concerns and issues expressed by aboriginal communities and groups, the Proponent’s analysis of those concerns and issues, and the actions taken to address those concerns and issues;
  - how aboriginal input was incorporated into the Project development, impact mitigation and monitoring; and
  - consultation undertaken with aboriginal communities and groups with respect to traditional ecological knowledge and traditional use of land.
- Describe plans to maintain the public engagement and aboriginal consultation process following completion of the EIA report to ensure that the public and aboriginal peoples will have an appropriate forum for expressing their views on the ongoing development, operation and reclamation of the Project.

### **PROJECT DESCRIPTION**

#### **Project Development**

Relationship to the Existing Coal Valley Mine

- Describe, for each EA discipline, the lessons learned from the public engagement and Aboriginal consultation process and the approvals process for the Coal Valley Mine.

#### **Regional and Cooperative Initiatives**

- Discuss the Proponent’s regional monitoring activities including:
  - monitoring performed in conjunction with other stakeholders, aboriginal communities and groups; and

## **ENVIRONMENTAL ASSESSMENT**

### **Land Use and Management**

#### Impact Assessment

- Identify the potential impact of the Project on land uses, including:
  - impacts of the Project on public access, regional recreational activities, Aboriginal land use and other land uses during and after development activities.

## **TRADITIONAL ECOLOGICAL KNOWLEDGE AND LAND USE**

- Provide:
  - a map of traditional land use areas (if the Aboriginal community or group is willing to have these locations disclosed);
  - a map of cabin sites, spiritual sites, graves and other traditional use sites considered historic resources under the Historical Resources Act (if the Aboriginal community or group is willing to have these locations disclosed), as well as traditional trails and resource activity patterns;
  - a description of the extent of traditional use of land and biological resources in the Project Area, including fishing, hunting, trapping, nutritional or medicinal plant harvesting, and cultural use by affected Aboriginal peoples; and
  - a discussion of:
    - access to traditional lands in the Project Area during all stages of the Project,
    - the vegetation and wildlife used for traditional, food, ceremonial, medicinal and other purposes, and
    - Aboriginal views on land reclamation.
- Determine the impact of the Project on traditional uses and culture and identify possible mitigation strategies.

## **PUBLIC HEALTH AND SAFETY ASSESSMENT**

- Describe any features or characteristics of the Project that may have implications for public health or the delivery of regional health services that are different from the existing Coal Valley Mine. Determine whether there may be implications for public health arising from the Project that are different from the existing Coal Valley Mine. Specifically:
  - document any health concerns identified by aboriginal communities or groups resulting from impacts of existing development and of the Project specifically on their traditional lifestyle and include an aboriginal receptor type in the assessment;

## **SOCIO-ECONOMIC ASSESSMENT**

### **Impact Assessment**

- Describe the socio-economic impacts of construction and operation of the Project, including:
  - impacts related to:
    - effects on First Nations and Métis (e.g., traditional land use and social and cultural implications);
- Discuss options for mitigating impacts including:
  - plans to work with First Nations and Métis communities and groups and other local residents and businesses regarding employment, training needs, and other economic development opportunities arising from the Project;

### **MONITORING**

- Discuss CVRI’s regional monitoring activities including:
  - monitoring performed in conjunction with other stakeholders, including Aboriginal communities and groups; and
- Discuss:
  - how monitoring data will be disseminated to the public, Aboriginal communities or other interested parties; and

Other Sections of the Environmental Assessment will incorporate information derived from consultation and traditional use studies as specified in the Terms of Reference and where appropriate.

Through the above program, CVRI is confident that effective and meaningful consultation with aboriginal groups will continue and be concluded regarding Coal Valley Mine’s Robb Trend Project.



## Appendix A

### Métis, Nakcowinewak, and Foothills Ojibway Engagement Plan

The proposed CVRI Robb Trend project consultation plan, activities, schedule, and reporting for the Métis, Nakcowinewak Nation of Canada, and Foothills Ojibway Society will not differ structurally or substantially than for that described for the First Nations communities. The reader should refer to relevant portions of Sections 1, 2, and 3 for a description of these activities. Table A.1 below provides a list of primary contacts for these groups, with a description of the current status of consultation for the Robb Trend with each group below.

**Table A.1 Potentially Affected Aboriginal Communities**

<b>Aboriginal Group</b>	<b>Primary Contacts</b>	<b>Contact Information</b>
Foothills Ojibway Society	Jimmy O'Chiese	Box 6395 Hinton, AB T7V 1X7 phone 780-865-1865
Metis Nation of Alberta Zone IV	Cecil Bellrose Melanie Omeniho Kris Gladue	11724 95th St. Edmonton, AB T5G 1L9 phone 780-944-9288 fax 780-455-5546
Nakcowinewak Nation of Canada	Bill Whitehorse Jean Whitehorse Darryl McLeod	Box 6116 Hinton, AB T7V 1X5 phone 403-780-865-4600 fax 780-865-5900

#### **FOOTHILLS OJIBWAY SOCIETY (FOS)**

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FOS was consulted on and undertook traditional use studies for the Robb Trend, Mercoal West, and Yellowhead Tower mine extension proposals. CVRI and FOS have entered into a preliminary agreement as a result of the previous consultation efforts. This agreement will facilitate continuing consultation efforts with CVRI and continuing traditional use studies in the area. This relationship should facilitate the additional consultation efforts and traditional use studies required for the areas that might be added as

part of the Robb Trend Project. FOS will likely undertake additional field studies of the expanded Robb Trend Project area.

### **MÉTIS NATION OF ALBERTA (MNA)**

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CVRI entered into discussions with the MNA (Métis Hinton Local #474 of Métis Regional Council – Zone IV of the Métis Nation of Alberta) at a relatively late planning date for the previous mine extensions. CVRI is currently in the midst of on-going consultation regarding a MNA-led study of Métis history and traditional uses of the region. Given their lower level of previous involvement, Métis consultation and traditional use studies may be more intensive for the Robb Trend Project than the other aboriginal groups.

### **NAKOWINEWAK NATION OF CANADA**

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Nakcowinewak traditional use studies and consultation efforts for the extension projects (including Robb Trend Project) were done in tandem with the O'Chiese First Nation. Currently CVRI has an agreement with these groups that has resulted in avoidance of traditional use areas within the Robb Trend mine extension deemed most significant, and provides for long-term consultation and remediation activities using aboriginal knowledge pertaining to medicinal plants in the area. The existing relationship between Nakcowinewak and CVRI is solid, and should help facilitate consultation for the additional areas. We expect that the Nakcowinewak will wish to undertake traditional use studies of the additional areas that might be included in the Robb Trend Project.

## Appendix B

### Plain Language Project Description

**COAL VALLEY RESOURCES INC.**

**ROBB TREND PROJECT**

**DESCRIPTION**



**Part of the Aboriginal Consultation  
Program**

**Revised February 2011**

## **General Manager's Message**

Coal Valley Resources Inc. (CVRI) has been mining coal in Yellowhead County since 1978. Nearly 500 people are employed at the Coal Valley Mine. To date CVRI has supplied 60 million tonnes of coal to the market place. CVRI is an important industry in the local and provincial economy.

CVRI wants to continue mining in Yellowhead County well into the future. This involves developing available coal reserves close to existing mining operations. In 2006, CVRI announced plans to extend mine operations into the Mercoal West and Yellowhead Tower lease areas. Approvals have been granted and production has started in these two areas.

At current rates of coal production, CVRI will require additional mining areas by the middle of 2014. CVRI hopes to begin work on the Robb Trend Project in 2014 because of this. The Robb Trend Project is close to existing mining operations. CVRI announced plans to mine in the Robb Trend in 2006 with the Mercoal West and Yellowhead Tower areas. Development of Robb Trend will allow the Coal Valley Mine plant to operate until 2030.

Aboriginal consultation is an integral part of early planning for the Robb Trend Project. CVRI wants to ensure that all potentially affected aboriginal groups are kept aware of mining plans. This Project Description provides you with information about the Robb Trend Project. This includes information about the company, the area to be mined, how the coal is mined, environmental studies, economic benefits, and a schedule for the project.

CVRI prides itself on being a good neighbour. We will strive to keep you informed and provide many opportunities for you to give input. We welcome and appreciate your continued participation in the Robb Trend Project. It is important that your interests and concerns are identified, understood, respected, and addressed.

Yours truly,

Dave Rutland  
General Manager  
Coal Valley Resources Inc.

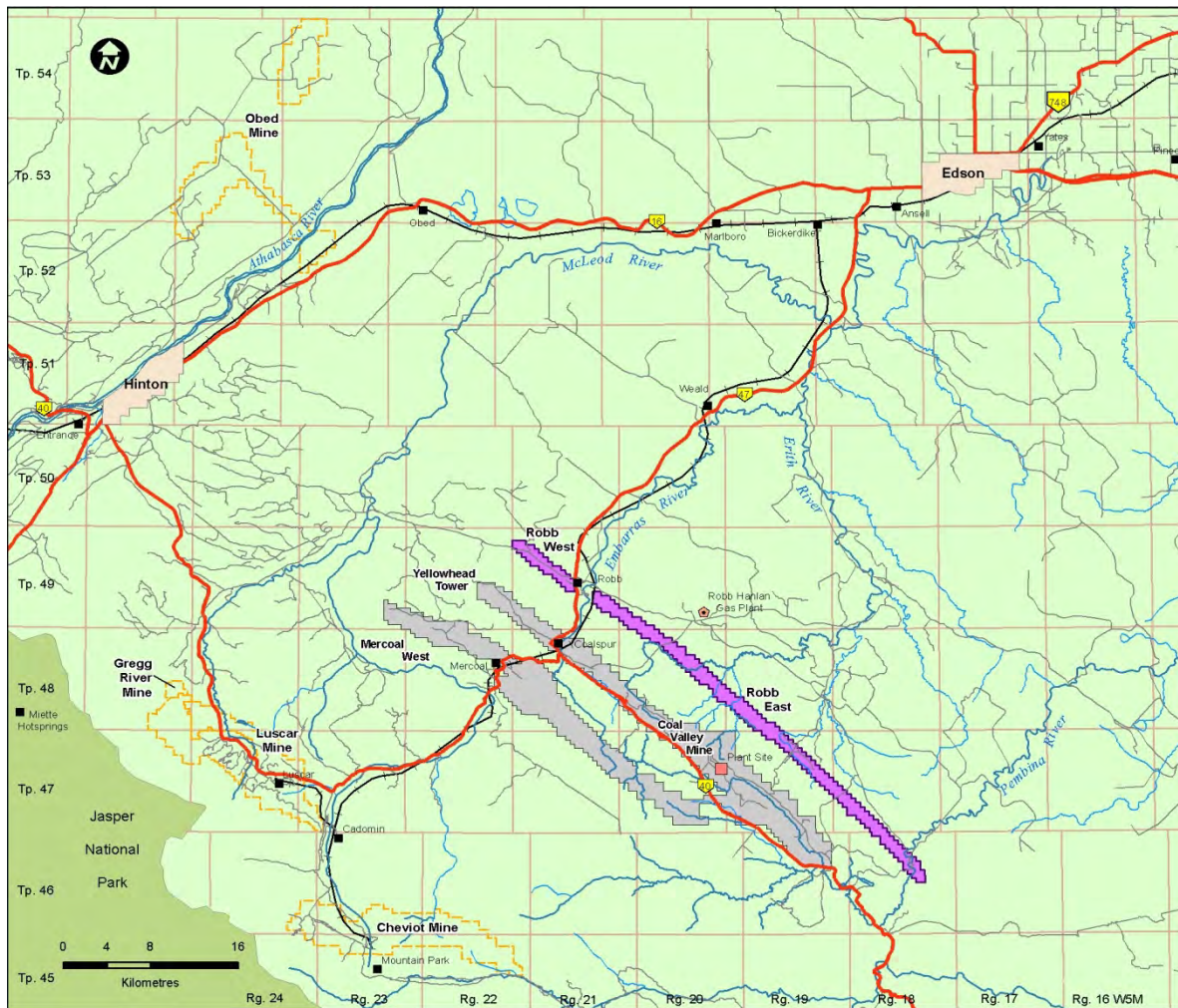
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## Introduction

Coal Valley Resources Inc. (CVRI) wants to expand mining operations in Yellowhead County. The proposed new mine is called the “Robb Trend Project.” It is located about 100 km south of Edson in the Coal Branch area (Figure 1). With a mining history dating back to the early 20<sup>th</sup> century, this area of the province is rich in coal resources. Coal mining in this region has been happening for well over 100 years.

**Figure 1 – Robb Trend Project Location**



CVRI announced their plan to develop the Robb Trend Project in 2006 along with the Mercoal West and the Yellowhead Tower projects. Mining is underway in Mercoal West and expected to begin in Yellowhead Tower in 2011. CVRI is now preparing for the next mine development phase, the Robb Trend Project. Other parts of CVRI’s Coal Valley Mine and related activities in the area are also shown on Figure 1.

As part of their planning for the new mine area, CVRI is consulting with both public and aboriginal groups. This Project Description has been written for aboriginal people who may be affected by the Robb Trend project. It includes information about:

- company background
- location and size of the Robb Trend Project
- proposed mine development
- regulatory review process
- project schedule

## **Aboriginal Consultation**

Meaningful consultation with aboriginal groups is an important part of the Robb Trend Project. CVRI has been working with aboriginal groups on consultation and traditional use studies for its extension areas. The company has had information meetings, tours, and traditional use studies for the Robb Trend Project since 2006. CVRI has talked with aboriginal members and leaders about their environmental concerns. The company has worked to address these concerns. Since those early discussions, the size of the Robb Trend Project has changed. Additional consultation and studies may be needed. CVRI is committed to:

- Have ongoing, open, and cooperative dialogue with aboriginal groups affected by the Robb Trend Project. CVRI will try where possible to address concerns in the early stages of the Robb Trend Project;
- Make it a priority to meet with aboriginal people who reside near, use, or have a specific interest in the Robb Trend Project area or adjacent areas;
- Involve aboriginal groups in decision making for the Robb Trend Project. They will be invited to view, question, and understand company plans and work. Aboriginal input will help the company choose the best possible development options.
- Where possible, seek “win – win” options to deal with aboriginal community concerns.
- Provide ongoing aboriginal consultation for the life of the Robb Trend Project.

## **Company Background**

The head office for Coal Valley Resources Inc. (CVRI) is in Edmonton. It is one of Canada’s largest producers of coal. CVRI is the 100% owner of the Coal Valley Mine. The company also operates the Obed Mountain Mine, and the reclaimed Gregg River Mine.



Over its history in Alberta, CVRI has established a track record of success in managing safe, efficient, and environmentally responsible mining operations. The company has been recognized locally and nationally for its safety and environmental achievements.

## **Mining Extension Description**

### **History**

The Coal Branch area has a mining history dating back to the early 20<sup>th</sup> century. Many old mining towns are found in the area. At first, coal mining was done using typical underground mining methods. Surface mining was started during the 1930s. The Coal Valley Mine has been in operation since 1978. It uses both truck & backhoe and dragline mining methods. Coal is mined from three different seams at the Coal Valley Mine. These seams are up to 270 metres below ground. The major seam ranges in thickness from 7.9 to 10.7 metres. The other seams range in thickness from 2.4 to 6.7 metres.

In 2005, CVRI expanded facilities at the Coal Valley Mine to process 4 million tonnes of thermal coal per year. Thermal coal is the type used to generate electricity. This \$125 million project doubled the coal wash plant capacity, and added additional mining equipment. At least 150 new permanent jobs were created.

In 2006 CVRI proposed the Mercoal West and Yellowhead Tower mining projects (see Figure 1). At the same time, the company had stated their plans to develop the Robb Trend Project. Mining is now underway in Mercoal West. Approvals have been given and mining is expected to start in Yellowhead Tower in 2011.

CVRI has begun the regulatory approval process for the Robb Trend Project. A study shows that mining in this area could release 50 to 60 million tonnes of coal for processing. This coal will be processed at the existing plant. This amount would provide CVRI with enough coal to operate until 2030.

### **Location and Size of Robb Trend Project**

The Robb Trend Project is located close to the community of Robb. It extends nearly 50 km from the Pembina River, past the community of Robb and incorporates coal leases on the north side of Highway 47. Overall it covers an area of about 7,500 hectares of land. When in operation, coal will have to be trucked an average of 10 km from mine areas in the Robb Trend to the present coal plant. The Embarras River and its tributaries drain the western portion of the Robb Trend Project. The Erith River and its tributaries run through the middle portion of the proposed mining area. The southern end of the Robb Trend Project area drains directly to the Pembina River system.

Steep ridges and broad valleys are the most common land features in the area. Some oil and gas related activities are seen throughout the area. This includes gas lines and wells in development to the north. Public access throughout much of the Robb Trend Project is limited both by the

nature of the terrain and the present industrial uses in this area. However, there is some local snowmobile and quad use close to the community of Robb. Hunting is active throughout the proposed mining area.

The Robb Trend Project is located in an area that is zoned for mining. The Coal Development Policy for Alberta was adopted in 1976. It guides the exploration and development of coal resources throughout the Province. Mining of coal deposits is permitted under strict control. This ensures environmental protection and satisfactory reclamation of any disturbed land.

The Coal Branch Sub-Regional Integrated Resource Plan (1990) is the Government of Alberta's resource management policy for public lands. In this plan, the Robb Project area is called the "Robb Highlands Regional Management Area (RMA)." The management plan for this RMA allows for a range of uses while recognizing the area's resource values.

Finally, the West Fraser Forest Management Area covers much of the Robb Trend Project. CVRI has a good relationship with West Fraser and will work with them to plan reclamation activities.

### **Mining Methods**

CVRI uses two mining methods depending on geology, structure, and type of mining pit. A large walking dragline is used in areas where the coal seam is relatively even in thickness and the area is flat (Figure 2). The dragline digs out the overburden (the soil and rock above the coal) and swings to the side to deposit the waste rock into large piles beside the mine pit. Where the coal is thicker and ground is steeper, large backhoes are used for mining (Figure 3). Where this method is used, a "stepped" pit is made which gets thinner and thinner as the pit gets deeper and deeper. Overburden is hauled by truck to nearby rock dumps or used as fill in nearby pits.



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The mining of coal involves a number of steps including:

- Timber Harvesting – In cooperation with the Forest Management Agreement (FMA) holder (West Fraser).
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- Rock Removal - The overburden rock is drilled and broken with the use of explosives. Mine equipment then removes the overburden to expose the coal seam.
- Coal Recovery – Coal is then dug out and hauled to the coal processing plant for cleaning.
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## **Coal Processing Plant**

No changes to the coal processing plant will happen as a result of the Robb Trend Project. All coal mined in the Robb Trend Project area will be hauled to the existing plant for processing.

The coal processing plant was expanded in 2005. The expansion included replacement of much of the coal processing equipment, changes to the coal dryer, and addition of other control equipment. The plant reached full capacity of 4 million tonnes per year in late 2006. Additional capacity and lowering of operating costs have been achieved.

Water used by the plant continues to be recirculated through the Coal Creek pond system. This is in keeping with the existing plant water system. Minimal 'make-up' volumes are required from groundwater sources.

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CVRI will do a large and thorough Environmental Assessment (EA) report. The report will allow the government, aboriginal groups, and others to understand the environmental impacts of the Robb Trend Project. The EA report will:

- describe current environmental conditions,
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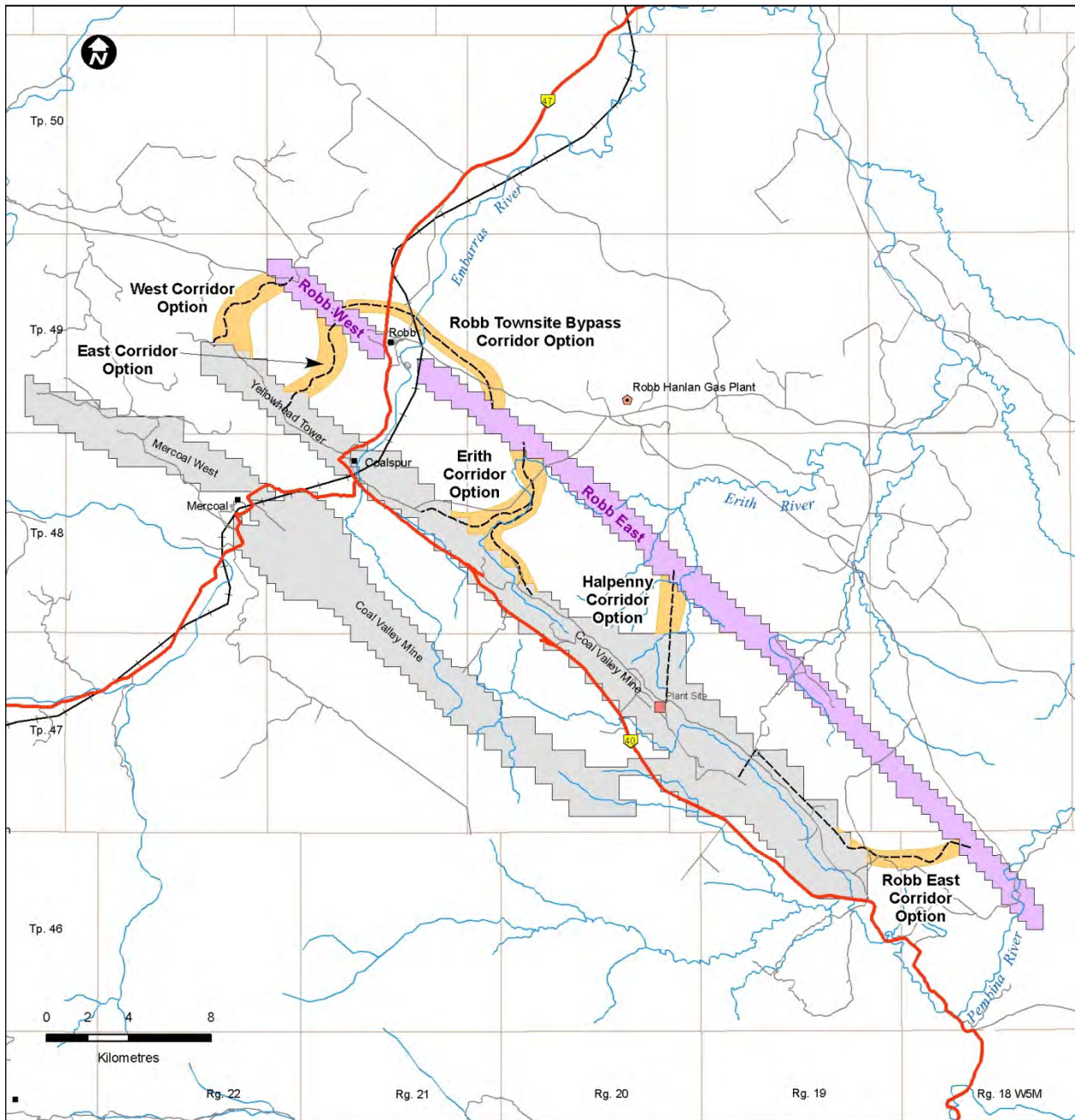
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Highway 47 and the Town of Robb separate the mining areas of the proposed Robb Trend Project into west and east mining areas. Access options need to be made that provide a safe and low-cost route. This route should allow for coal to be brought to the existing coal processing plant. It should also keep environmental and social impacts as small as possible. There are 6 access options being considered.

Access options are shown in Figure 5. Before choosing an access route, CVRI will seek public and aboriginal input to help make the decision.

**Figure 5 – Robb Trend Project Location**



## **Economic Benefits**

Almost 500 people are now employed at the Coal Valley Mine. To date they have supplied about 60 million tonnes of coal to the market place. This has had a significant long term positive effect on the local and provincial economy.

Continued mine development with the Robb Trend Project will create economic benefits that will last a long time. This will make the overall quality of life better for a significant portion of the local and regional population. CVRI works to create a relationship in which economic development, employment, environmental responsibility, and community benefits are created.

CVRI supplies coal for power generating purposes both in Canada and overseas. Over time the focus of CVRI's operations at the Coal Valley Mine has shifted to selling coal to buyers in the Pacific Rim. Pacific Rim countries lie around the Pacific Ocean. CVRI ships coal to countries such as South Korea and China in the Pacific Rim. The majority of the coal produced by the Robb Trend Project will be shipped via rail to the coast of British Columbia. Here it will be loaded on to ships bound for Pacific Rim countries.

CVRI believes that export coal markets will remain relatively strong into the future. This is because of:

- high and constantly changing natural gas prices in North America
- the movement of thermal coal into metallurgical coal markets (metallurgical coal is used for making steel)
- strong Chinese needs for coal
- increased demand in other North Asian countries

Development of the Robb Trend Project will provide the following benefits:

- CVRI will continue to employ skilled, well paid employees in full time positions
- Local, regional, and provincial contractors and retailers will continue to receive benefits by providing goods and services to the mine. CVRI will ensure that Alberta and Canadian engineering firms, contractors, manufacturers, and suppliers receive full and fair chances to compete in the supply of goods and services; and
- Municipal, Provincial, and Federal Governments will continue to receive revenue in the form of production royalties, license fees, and taxes;

## **Public Consultation Process**

CVRI will focus its Public Consultation process on communities that are near the Robb Trend Project. This includes Mercoal, Coalspur, and Robb. Public Consultation will also involve other communities and stakeholders (a person, group, or organization with an interest in a project). This includes discussions with First Nations, Non-government organizations, and other industries. Consultation will be adjusted to meet the needs of new groups of stakeholders as they are identified. This will make sure that all public concerns have been taken into account.

## **Regulatory Review Process**

The Robb Trend Project is at the beginning of the regulatory review process. A Project Description Document was submitted to the government in October 2010. It is the first step in the regulatory process.

Proposed Terms of Reference (ToR) for the EA have been prepared and are available for review and comment. Consultation with aboriginal communities, the general public, and government is important in the writing of the ToR. Alberta Environment issue and finalize the ToR. Once finalized, the ToR will provide an outline of the information needed to understand the environmental impacts of the Robb Trend Project.

Some of the important issues that will be discussed in the ToR include:

- Control of local problems such as noise, dust, and traffic from the coal haul road;
- Design and planning with the community of Robb to minimize impacts of new roads and utilities;
- Good management of surface and groundwater resources;
- Making a reclaimed landscape; and
- Protection of the aquatic environment and associated wildlife in the area

The next step is preparing the detailed environmental assessment (EA). This EA report is required under Alberta's *Environmental Protection and Enhancement Act* (EPEA). CVRI plans to submit the EA Report for the Robb Trend Project to Alberta Environment in July, 2011. The EA report will be available to aboriginal communities and the public for review and comment.

Table 1 on the next page lists the major government approvals required to do the project, and the Alberta regulatory agencies responsible for making those approvals.



**Table 1 Major Regulatory Approvals Required for the Project**

<b>Regulatory Body</b>	<b>Legislation</b>	<b>Application/Submission</b>	<b>Contact</b>
Alberta Environment	Environmental Protection and Enhancement Act	Environmental Assessment	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Energy Resources Conservation Board	Coal Conservation Act	Mine Permit Amendment	Application Coordinator Oil Sands Branch, Coal and Major Applications Energy Resources Conservation Board 640 – 5 Avenue SW Calgary, Alberta T2P 3G4 Telephone: 403-297-5366 Fax: 403-297-8122 E-mail: fares.haddad@ercb.ca
Alberta Environment	Environmental Protection and Enhancement Act	Construction, Operation and Reclamation Approval	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Energy Resources Conservation Board	Coal Conservation Act	Licence to develop mine pits and dumps	Application Coordinator Oil Sands Branch, Coal and Major Applications Energy Resources Conservation Board 640 – 5 Avenue SW Calgary, Alberta T2P 3G4 Telephone: 403-297-5366 Fax: 403-297-8122 E-mail: fares.haddad@ercb.ca
Alberta Environment	Water Act	Approval to Construct water management features and conduct pit dewatering	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Sustainable Resource Development	Public Lands Act	Surface dispositions	#203, Provincial Building 111 - 54 Street, Edson, AB T7E 1T2 Phone: 780-865-8267 Email: SRD.FNConsultlands-Foothills@gov.ab.ca

## Robb Trend Project Schedule

The EA and related applications for the Robb Trend Project will take about one year to complete. Work has already started on gathering information to support the required reports and applications. The regulatory agencies will require an additional one and a half years to complete their review. CVRI hopes to begin developing the Robb Trend Project in 2014. The proposed project schedule, with important dates for the Robb Trend Project is illustrated in Table 2 below:

<b>Table 2 Regulatory Approvals Schedule</b>					
	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Project Description and Consultation</b>	▲—————▶				
<b>Proposed Terms of Reference</b>	▲				
<b>Environmental Assessment</b>	■■■■■				
<b>Regulatory Review Process</b>		■■■■■			
<b>Approvals Issued</b>					▲
<b>Mine Construction</b>					▲

---

### Contact Information

Les LaFleur, P.Eng.  
 Project Manager  
 Robb Trend Project  
 Coal Valley Resources Inc.

Obed Mountain Mine  
 T 780-865-8607  
 F 780-865-8630  
 llafleur@sherrittcoal.ca

### Alternate Contact for Aboriginal Consultation

Dan Meyer, Ph.D.  
 Lifeways of Canada Limited  
 105, 809 Manning Road NE  
 Calgary, AB T2E 7M9

T 403-807-7981  
 F 403-730-5192  
 meyer@lifewaysofcanada.com

February 14, 2011

Les LaFleur  
Project Manager, Robb Trend Project  
Coal Valley Resources Inc  
Sherritt Coal, Mountain Operations  
Bag Service 4000, Hinton, AB T7V 1V8

RE: Approval of First Nations Consultation Plan  
Coal Valley Resources Inc (CVRI) proposed Robb Trend Project

Dear Mr LaFleur,

Alberta Environment has reviewed the First Nation Consultation Plan submitted on February 4, 2011 for the proposed Coal Valley Resources Inc. ("The proponent") Robb Trend project. The First Nations Consultation Plan is consistent with the requirements outlined in Alberta Environment's section (Part III) of Alberta's First Nations Consultation Guidelines on Land Management and Resource Development. In collaboration with Dion Lawrence, it has also been determined that the plan meets the consultation requirements of Alberta's Sustainable Resource Development (Part IV).

As contemplated in the Guidelines, and following discussions with "the Proponent," Alberta Environment is delegating the procedural aspects of consultation to Coal Valley Resources Inc. The delegated procedural aspects are as set out in the approved Consultation Plan.

Pursuant to the Policy and Guidelines, Alberta Environment will remain responsible for all substantive aspects of consultation, and any procedural aspects not delegated to Coal Valley Resources Inc. The responsibilities of Alberta Environment include:

- Providing advice and making information available to "the proponent", as able, regarding potential adverse impacts to Rights and Traditional Uses;
- Ensuring potentially affected First Nations receive early and adequate notification regarding the project application(s);
- Reviewing and approving "the Proponent's" Consultation Plan;
- Overseeing the consultation process by evaluating reports submitted by "the proponent;" and
- Making final decisions on EIA completeness and the approval application(s) once Alberta determines that consultation has been adequate.

All consultation activities with First Nations must be carried out in the manner described by the Guidelines, and proceed according to the approved Consultation Plan.

Alberta's First Nations Consultation Policy and Guidelines require consultation with potentially affected First Nations, and do not apply to Métis or other aboriginal communities. At this time, Alberta does not have information that would support a requirement for consultation with Métis

The logo for the Government of Alberta, featuring the word "Alberta" in a stylized, cursive script font, followed by a small square icon containing a stylized 'A'.

Freedom To Create. Spirit To Achieve.

communities concerning the proposed CVRI Robb Trend project. However, Alberta Environment understands that CVRI would like to include Métis groups in their Consultation Plan in an effort to be inclusive in consultation efforts and practice a "good neighbor" approach. Coal Valley Resources Inc. should notify Alberta Environment of any assertions or concerns raised by Métis groups during engagement and throughout the regulatory process.

Starting on February 4, 2011, and every two months following this date, you are required to provide Donna Hovsepian, Aboriginal Relations Advisor, with a report that outlines all of your First Nations consultation activities for the proposed Rob Trend project. Attached for your reference is a sample report template. If you have any questions about the First Nations consultation process or required documentation, please contact Donna Hovsepian at: 403-340-7750 or at 403-391-3959.

Reports will be required until the regulatory process has concluded on your project application pursuant to the Environmental Protection and Enhancement Act and/or the Water Act.

We recommend that you share your consultation plan with those First Nations who you have identified. Alberta Environment may require Coal Valley resources Inc. to undertake further consultation based on the receipt of new or additional information at any time during the regulatory approval process. Furthermore, Alberta environment encourages you to share your bi-monthly consultation reports with First Nations.

Please contact me if you have any questions concerning the procedures outlined in this letter.

Best regards,



Alvaro Loyola  
Manager, Regulatory Support  
Aboriginal Relations  
Alberta Environment

Cc: Corinne Kristensen, EA Coordinator, AENV  
Donna Hovsepian, Aboriginal Relations Advisor, AENV  
Dion Lawrence, SRD  
Sean Carriere, CEAA

**COAL VALLEY RESOURCES INC.**

**ROBB TREND PROJECT**

**DESCRIPTION**



**Part of the Aboriginal Consultation  
Program**

**Revised February 2011**

## **General Manager's Message**

Coal Valley Resources Inc. (CVRI) has been mining coal in Yellowhead County since 1978. Nearly 500 people are employed at the Coal Valley Mine. To date CVRI has supplied 60 million tonnes of coal to the market place. CVRI is an important industry in the local and provincial economy.

CVRI wants to continue mining in Yellowhead County well into the future. This involves developing available coal reserves close to existing mining operations. In 2006, CVRI announced plans to extend mine operations into the Mercoal West and Yellowhead Tower lease areas. Approvals have been granted and production has started in these two areas.

At current rates of coal production, CVRI will require additional mining areas by the middle of 2014. CVRI hopes to begin work on the Robb Trend Project in 2014 because of this. The Robb Trend Project is close to existing mining operations. CVRI announced plans to mine in the Robb Trend in 2006 with the Mercoal West and Yellowhead Tower areas. Development of Robb Trend will allow the Coal Valley Mine plant to operate until 2030.

Aboriginal consultation is an integral part of early planning for the Robb Trend Project. CVRI wants to ensure that all potentially affected aboriginal groups are kept aware of mining plans. This Project Description provides you with information about the Robb Trend Project. This includes information about the company, the area to be mined, how the coal is mined, environmental studies, economic benefits, and a schedule for the project.

CVRI prides itself on being a good neighbour. We will strive to keep you informed and provide many opportunities for you to give input. We welcome and appreciate your continued participation in the Robb Trend Project. It is important that your interests and concerns are identified, understood, respected, and addressed.

Yours truly,

Dave Rutland  
General Manager  
Coal Valley Resources Inc.

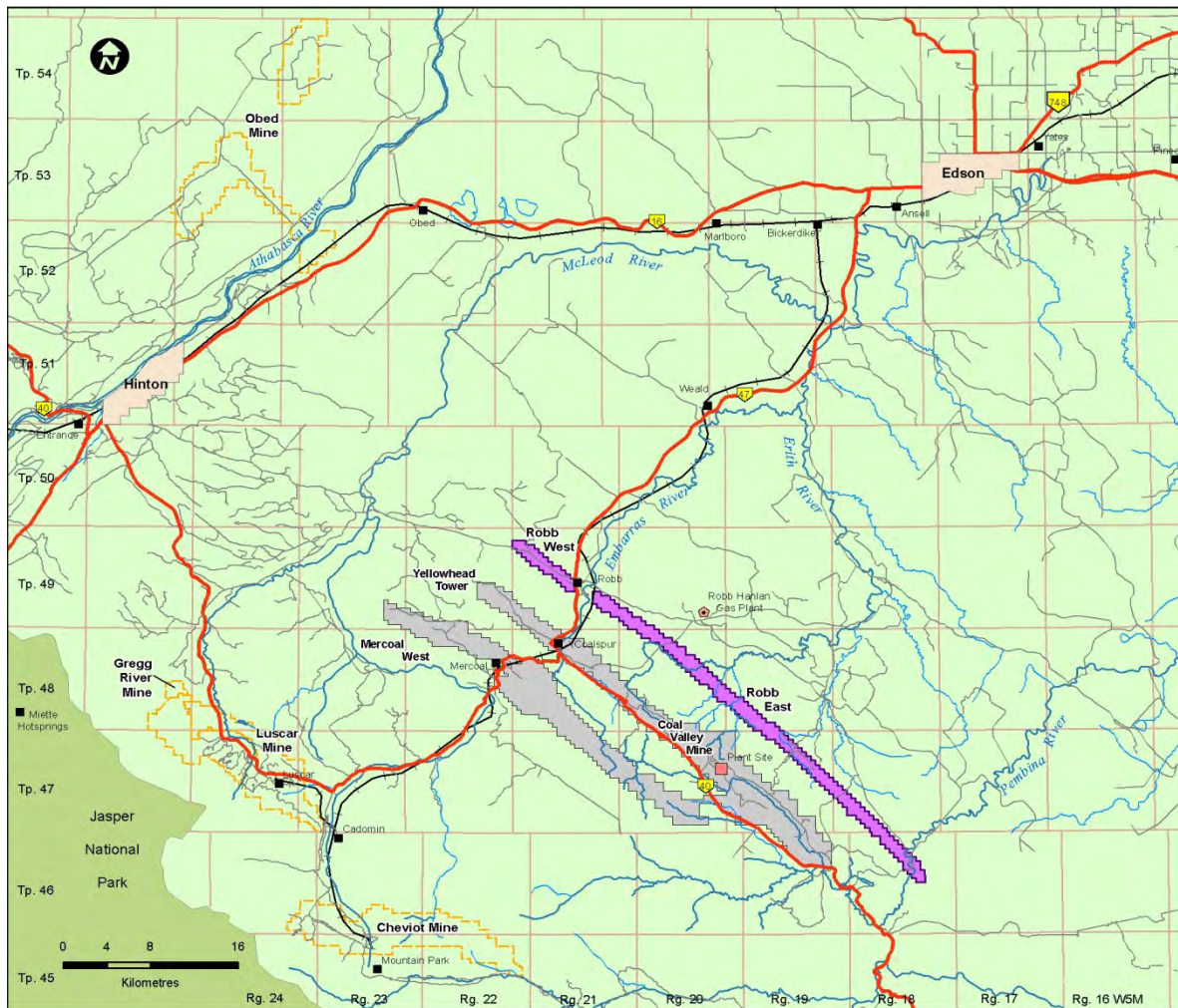
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## Introduction

Coal Valley Resources Inc. (CVRI) wants to expand mining operations in Yellowhead County. The proposed new mine is called the “Robb Trend Project.” It is located about 100 km south of Edson in the Coal Branch area (Figure 1). With a mining history dating back to the early 20<sup>th</sup> century, this area of the province is rich in coal resources. Coal mining in this region has been happening for well over 100 years.

**Figure 1 – Robb Trend Project Location**



CVRI announced their plan to develop the Robb Trend Project in 2006 along with the Mercoal West and the Yellowhead Tower projects. Mining is underway in Mercoal West and expected to begin in Yellowhead Tower in 2011. CVRI is now preparing for the next mine development phase, the Robb Trend Project. Other parts of CVRI’s Coal Valley Mine and related activities in the area are also shown on Figure 1.



As part of their planning for the new mine area, CVRI is consulting with both public and aboriginal groups. This Project Description has been written for aboriginal people who may be affected by the Robb Trend project. It includes information about:

- company background
- location and size of the Robb Trend Project
- proposed mine development
- regulatory review process
- project schedule

## **Aboriginal Consultation**

Meaningful consultation with aboriginal groups is an important part of the Robb Trend Project. CVRI has been working with aboriginal groups on consultation and traditional use studies for its extension areas. The company has had information meetings, tours, and traditional use studies for the Robb Trend Project since 2006. CVRI has talked with aboriginal members and leaders about their environmental concerns. The company has worked to address these concerns. Since those early discussions, the size of the Robb Trend Project has changed. Additional consultation and studies may be needed. CVRI is committed to:

- Have ongoing, open, and cooperative dialogue with aboriginal groups affected by the Robb Trend Project. CVRI will try where possible to address concerns in the early stages of the Robb Trend Project;
- Make it a priority to meet with aboriginal people who reside near, use, or have a specific interest in the Robb Trend Project area or adjacent areas;
- Involve aboriginal groups in decision making for the Robb Trend Project. They will be invited to view, question, and understand company plans and work. Aboriginal input will help the company choose the best possible development options.
- Where possible, seek “win – win” options to deal with aboriginal community concerns.
- Provide ongoing aboriginal consultation for the life of the Robb Trend Project.

## **Company Background**

The head office for Coal Valley Resources Inc. (CVRI) is in Edmonton. It is one of Canada’s largest producers of coal. CVRI is the 100% owner of the Coal Valley Mine. The company also operates the Obed Mountain Mine, and the reclaimed Gregg River Mine.

Over its history in Alberta, CVRI has established a track record of success in managing safe, efficient, and environmentally responsible mining operations. The company has been recognized locally and nationally for its safety and environmental achievements.

## **Mining Extension Description**

### **History**

The Coal Branch area has a mining history dating back to the early 20<sup>th</sup> century. Many old mining towns are found in the area. At first, coal mining was done using typical underground mining methods. Surface mining was started during the 1930s. The Coal Valley Mine has been in operation since 1978. It uses both truck & backhoe and dragline mining methods. Coal is mined from three different seams at the Coal Valley Mine. These seams are up to 270 metres below ground. The major seam ranges in thickness from 7.9 to 10.7 metres. The other seams range in thickness from 2.4 to 6.7 metres.

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The Robb Trend Project is located close to the community of Robb. It extends nearly 50 km from the Pembina River, past the community of Robb and incorporates coal leases on the north side of Highway 47. Overall it covers an area of about 7,500 hectares of land. When in operation, coal will have to be trucked an average of 10 km from mine areas in the Robb Trend to the present coal plant. The Embarras River and its tributaries drain the western portion of the Robb Trend Project. The Erith River and its tributaries run through the middle portion of the proposed mining area. The southern end of the Robb Trend Project area drains directly to the Pembina River system.

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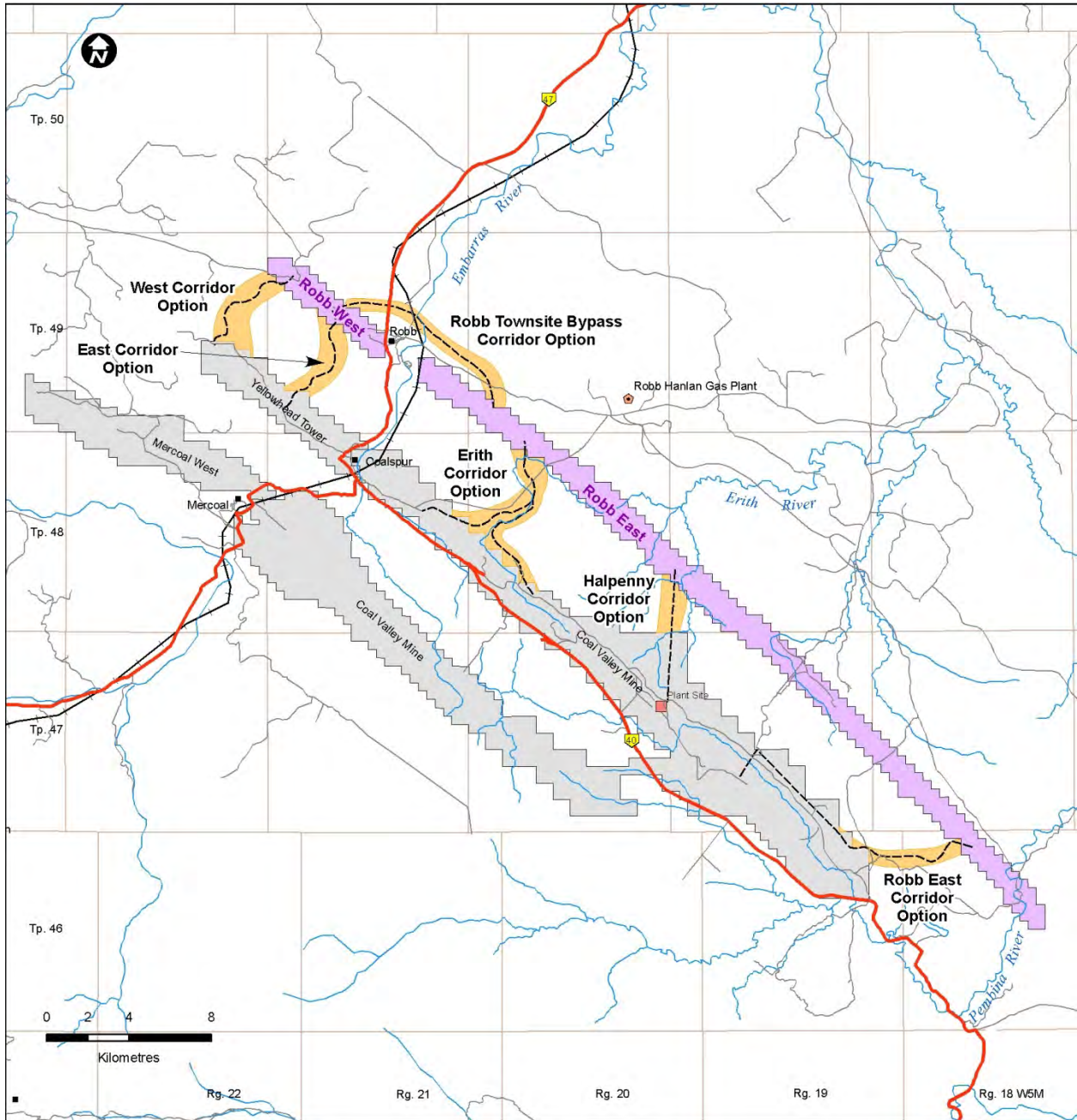
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Almost 500 people are now employed at the Coal Valley Mine. To date they have supplied about 60 million tonnes of coal to the market place. This has had a significant long term positive effect on the local and provincial economy.

Continued mine development with the Robb Trend Project will create economic benefits that will last a long time. This will make the overall quality of life better for a significant portion of the local and regional population. CVRI works to create a relationship in which economic development, employment, environmental responsibility, and community benefits are created.

CVRI supplies coal for power generating purposes both in Canada and overseas. Over time the focus of CVRI's operations at the Coal Valley Mine has shifted to selling coal to buyers in the Pacific Rim. Pacific Rim countries lie around the Pacific Ocean. CVRI ships coal to countries such as South Korea and China in the Pacific Rim. The majority of the coal produced by the Robb Trend Project will be shipped via rail to the coast of British Columbia. Here it will be loaded on to ships bound for Pacific Rim countries.

CVRI believes that export coal markets will remain relatively strong into the future. This is because of:

- high and constantly changing natural gas prices in North America
- the movement of thermal coal into metallurgical coal markets (metallurgical coal is used for making steel)
- strong Chinese needs for coal
- increased demand in other North Asian countries

Development of the Robb Trend Project will provide the following benefits:

- CVRI will continue to employ skilled, well paid employees in full time positions
- Local, regional, and provincial contractors and retailers will continue to receive benefits by providing goods and services to the mine. CVRI will ensure that Alberta and Canadian engineering firms, contractors, manufacturers, and suppliers receive full and fair chances to compete in the supply of goods and services; and
- Municipal, Provincial, and Federal Governments will continue to receive revenue in the form of production royalties, license fees, and taxes;

## **Public Consultation Process**

CVRI will focus its Public Consultation process on communities that are near the Robb Trend Project. This includes Mercoal, Coalspur, and Robb. Public Consultation will also involve other communities and stakeholders (a person, group, or organization with an interest in a project). This includes discussions with First Nations, Non-government organizations, and other industries. Consultation will be adjusted to meet the needs of new groups of stakeholders as they are identified. This will make sure that all public concerns have been taken into account.



## Regulatory Review Process

The Robb Trend Project is at the beginning of the regulatory review process. A Project Description Document was submitted to the government in October 2010. It is the first step in the regulatory process.

Proposed Terms of Reference (ToR) for the EA have been prepared and are available for review and comment. Consultation with aboriginal communities, the general public, and government is important in the writing of the ToR. Alberta Environment issue and finalize the ToR. Once finalized, the ToR will provide an outline of the information needed to understand the environmental impacts of the Robb Trend Project.

Some of the important issues that will be discussed in the ToR include:

- Control of local problems such as noise, dust, and traffic from the coal haul road;
- Design and planning with the community of Robb to minimize impacts of new roads and utilities;
- Good management of surface and groundwater resources;
- Making a reclaimed landscape; and
- Protection of the aquatic environment and associated wildlife in the area

The next step is preparing the detailed environmental assessment (EA). This EA report is required under Alberta's *Environmental Protection and Enhancement Act* (EPEA). CVRI plans to submit the EA Report for the Robb Trend Project to Alberta Environment in July, 2011. The EA report will be available to aboriginal communities and the public for review and comment.

Table 1 on the next page lists the major government approvals required to do the project, and the Alberta regulatory agencies responsible for making those approvals.

**Table 1 Major Regulatory Approvals Required for the Project**

<b>Regulatory Body</b>	<b>Legislation</b>	<b>Application/Submission</b>	<b>Contact</b>
Alberta Environment	Environmental Protection and Enhancement Act	Environmental Assessment	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Energy Resources Conservation Board	Coal Conservation Act	Mine Permit Amendment	Application Coordinator Oil Sands Branch, Coal and Major Applications Energy Resources Conservation Board 640 – 5 Avenue SW Calgary, Alberta T2P 3G4 Telephone: 403-297-5366 Fax: 403-297-8122 E-mail: fares.haddad@ercb.ca
Alberta Environment	Environmental Protection and Enhancement Act	Construction, Operation and Reclamation Approval	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Energy Resources Conservation Board	Coal Conservation Act	Licence to develop mine pits and dumps	Application Coordinator Oil Sands Branch, Coal and Major Applications Energy Resources Conservation Board 640 – 5 Avenue SW Calgary, Alberta T2P 3G4 Telephone: 403-297-5366 Fax: 403-297-8122 E-mail: fares.haddad@ercb.ca
Alberta Environment	Water Act	Approval to Construct water management features and conduct pit dewatering	Alberta Environment Regulatory Approvals Centre Attention: Director, Northern Region 9th floor, Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6 Telephone: 780-427-6311 Fax: 780-422-0154
Sustainable Resource Development	Public Lands Act	Surface dispositions	#203, Provincial Building 111 - 54 Street, Edson, AB T7E 1T2 Phone: 780-865-8267 Email: SRD.FNConsultlands-Foothills@gov.ab.ca

## Robb Trend Project Schedule

The EA and related applications for the Robb Trend Project will take about one year to complete. Work has already started on gathering information to support the required reports and applications. The regulatory agencies will require an additional one and a half years to complete their review. CVRI hopes to begin developing the Robb Trend Project in 2014. The proposed project schedule, with important dates for the Robb Trend Project is illustrated in Table 2 below:

<b>Table 2 Regulatory Approvals Schedule</b>					
	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Project Description and Consultation</b>	▲—————▶				
<b>Proposed Terms of Reference</b>	▲				
<b>Environmental Assessment</b>	████████████████				
<b>Regulatory Review Process</b>		████████████████████████████████████			
<b>Approvals Issued</b>					▲
<b>Mine Construction</b>					▲

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**Section D**  
**Environmental Impact Assessment**  
**(EIA) Methodology**



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## **D ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY**

The Coal Valley Resources Inc. (CVRI) application for regulatory approval for the Robb Trend Project (Project) is an application that contains all the required information for the Environmental Impact Assessment (EIA) report, including Cumulative Effects Assessment (CEA). The application contains the environmental and socio-economic baseline reports, Project specific and cumulative effects, impact predictions and mitigation and monitoring.

CVRI was advised by Alberta Environment and Water (AEW) that the Project is a mandatory activity pursuant to Schedule 1(j) of the Environmental Assessment (Mandatory and Exempted Activities) Regulation (in a letter from AENV to CVRI on November 9, 2010) requiring an EIA.

This section of the Application provides a description of the methodology used to prepare the EIA report. This methodology was adopted from several sources [Barnes et al. (1993); Beanlands and Duinker (1983); FEARO (1990); FEARO (1994b); Hegmann et al. (1999); Hegmann et al. (1995); Roots (1994)] and has been used successfully in the environmental evaluation of many resource and industrial projects and activities. This methodology is practical, technically sound, and has been accepted previously by provincial and federal regulators (including AEW, ERCB, and Department of Fisheries and Oceans Canada [DFO]) as an appropriate assessment methodology.

Project-specific effects are changes that are predicted to occur to the biophysical or social environment caused solely by the Project as a result of the proposed activities included in the scope of the Project. Cumulative effects are changes that are predicted to occur to the natural or social environment that are caused by the interaction residual effects of the Project (*i.e.*, an effect remaining after the application of mitigation) with residual effects of other past, present and planned projects or activities as defined in the Terms of Reference (ToR).

At the time of application submission, the Federal Government, through the Canadian Environmental Assessment Agency, has advised the CVRI that the *Canadian Environmental Assessment Act* (CEAA) will likely apply to the Project as fish bearing streams will be affected. At this time the federal responsible authority is unknown. In anticipation of the “federal trigger” this document has been prepared to satisfy federal EIA requirements under the CEAA. Consequently the EIA methodology selected had to satisfy both Federal and Provincial jurisdictions because of the Canada - Alberta Agreement on Environmental Assessment Cooperation.

### **D.1 EIA TERMS OF REFERENCE**

CVRI submitted its Public Disclosure Document (PDD) and Proposed Terms of Reference (ToR) for the Project in November 2010. The public review process for the draft ToR included advertised Public Notices with a review period (ending June 17, 2011) for interested parties to submit comments directly to AEW. AEW reviewed public comments on the Proposed ToR and issued the Final ToR on August 4, 2011.

The ToR and PDD were made available for review by the public at the following locations:

- Edson Public Library, 4726 – 8<sup>th</sup> Avenue, Edson, Alberta;
- Hinton Municipal Library, 803 Switzer Drive, Hinton, Alberta;
- Yellowhead County Office, 2716 1st Avenue, Edson, Alberta;
- Alberta Environment’s Register of Environmental Assessment, 111 Twin Atria Bldg., 4999 – 98 Avenue, Edmonton, Alberta, Attn: Melanie Daneluk; and
- to stakeholders via direct mailout.

In the preamble to the EIA Terms of Reference the environmental assessment overview and expected outcomes from the process are outlined and it states:

### ***SCOPE OF EIA REPORT***

*CVRI shall prepare and submit an EIA Report that examines the environmental socio-economic impacts of the Robb Trend Project. The EIA Report shall be prepared considering all applicable provincial and federal legislation, codes of practice, guidelines, standards and directives.*

*The EIA Report shall be prepared in accordance with these Terms of Reference and the environmental information requirements prescribed under EPEA and associated regulations, and the Canadian Environmental Assessment Act if applicable. The EIA Report will form part of CVRI’s application to the Energy Resources Conservation Board (ERCB). An EIA Report summary will also be included as part of the ERCB Application.*

A Concordance Table (that cross-references the ToR with the sections of the Application and EIA) is provided in [Appendix 1](#). The EIA has been prepared to fulfil the requirements specified in the ToR, as well as federal legislation which apply to the Project. However, consistent with the iterative nature of environmental assessment, this Application also addresses additional issues identified by government review agencies and the general public during the collection of baseline environmental information, the continuing consultation/engagement processes and the preparation of the EIA report.

On April 15, 2010 CVRI was notified by DFO that components of the Project will require approval and/or authorization under the *Fisheries Act*. As such, the Project is required to be completed in accordance with the CEAA. It followed that the Project would be subject to a Comprehensive Study. A concordance table cross-referencing the requirements outlined in the Comprehensive Study Checklist with the applicable sections of the application is included in [Appendix 2](#).

## **D.2 SCOPE OF ASSESSMENT**

### **D.2.1 SCOPE OF THE PROJECT**

The scope of the Project for the purposes of the EIA includes all phases (construction, operation, and reclamation and closure) of the Project and the associated facilities and infrastructure required to carry out these activities. Specifically, the scope of the Project includes:

- construction of access roads for the purposes of predevelopment activities (*i.e.*, soil salvage and blasting);
- construction of coal haul roads and powerlines;
- temporary fuelling stations;
- water management facilities that include settling impoundments, sumps, ditches and mined out areas;
- pit and dump areas for the Project development area; and
- reclamation of the above activities.

A full description of the Project is included in [Section C](#) of this Application.

### **D.2.2 VALUED ENVIRONMENTAL COMPONENTS**

The Project EIA report has addressed impact concerns by identifying Valued Environmental Components (VECs). VECs for the Project are those environmental attributes associated with the proposed Project development, which have been identified to be of concern by the public, government or professional community. CVRI has been actively engaged in stakeholder consultation with various components of development for the past few years. This continuous communication has provided CVRI with valuable information to determine the VECs. VECs consider both biological (*i.e.*, ecosystem) and socio-economic attributes because of the broad-based definition of environmental effect as outlined both in federal and provincial legislation.

In the *CEAA*, an environmental effect refers to any change that the Project may cause in the environment. This includes the effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, palaeontological or architectural significance.

For each VEC measurable parameters were selected to facilitate quantitative or qualitative measurement of potential Project effects and cumulative effects. Measurable parameters provide a means to determine the level or amount of change in a VEC. Each discipline was responsible for identifying and defining measurable parameters for their VECs. The degree of change in these measurable parameters was used to help characterize Project specific and cumulative effects and evaluate the significance of the residual effects. Where possible, thresholds or standards were identified for each measurable parameter.

A list of the VECs identified for the Project is presented in each Consultant's Report. The format and styles may vary depending on how the experts approached the assessment. The VEC categories identified that may be affected by the Project are:

- Air Quality;
- Fisheries;
- Groundwater;
- Historical Resources;
- Human Health;



- Hydrology;
- Mammalian Carnivores;
- Noise;
- Socio-economics;
- Soils;
- Surface Water Quality;
- Traditional Land Use;
- Vegetation Wetlands and Rare Plants;
- Wildlife (ungulates, small mammals, avifauna, amphibians);
- Greenhouse Gas and Climate Change; and
- Land and Resources Use.

### **D.2.3 PROJECT FOOTPRINT AND STUDY AREAS**

The spatial boundaries for the EIA encompass the Project Footprint Area and other local and regional areas, determined by the characteristics of each VEC, where an effect from the Project can reasonably be expected. The Project Footprint includes lands subject to direct disturbance from the Project and associated infrastructure, including access and utility corridors. The Project Footprint is approximately 5,729 ha and is shown on [Figure A.1-2](#).

Spatial (geographic), temporal (length of time), and administrative boundaries for the assessment of environmental effects were established for each VEC.

Spatial boundaries are established based on the zone of the Project influence, beyond which the potential environmental, cultural and socio-economic effects of the Project are expected to be non-detectable. VEC-specific boundaries are established for both a Local Study Area (LSA), for Project-specific effects, and a Regional Study Area (RSA), for cumulative effects. For most biophysical components of the environmental assessment, the LSA consists of the Project footprint. This is where potential physical disturbances during construction, operations and closure activities will occur.

Exceptions include the effects of the Project on water quality and quantity, the LSA for which is determined in terms of affected watersheds. Spatial boundaries for assessing socio-economic and community effects tend to be broader than the immediate footprint of the Project, to account for potential effects on factors such as existing land uses, transportation, community wellness and public health. RSAs for cumulative effects assessment are defined by the furthest extent that Project-specific effects are expected to act in combination with effects from other projects and activities. The study area boundaries are shown on [Figures D.2.3-1](#) and [D.2.3-2](#). Specific spatial and temporal dimensions for each discipline, including the rationale for VEC specific LSAs and RSAs, are presented in [Section E](#) and the respective Consultant Reports in the Application.

Temporal boundaries for the effects assessment are established in consideration of the construction period for the Project, operational life of the Project and anticipated period for reclamation and closure of the site. The proposed schedule for the construction, operation and

closure of the Project is expected to be approximately 25 years, with additional years of reclamation and monitoring to follow.

#### D.2.4 ASSESSMENT CASES

Assessment scenarios are required to be defined for the EIA. The EIA considers the following assessment scenarios:

- a) **Baseline Case**, which includes existing environmental conditions and existing projects or “approved” activities;
- b) **Application Case**, which includes the Baseline Case plus the Project; and
- c) **Cumulative Effects Assessment (CEA) Case**, which includes past studies, existing and anticipated future environmental conditions, existing projects or activities, plus other “planned” projects or activities.

For the purposes of defining assessment scenarios, “approved” means approved by any federal, provincial or municipal regulatory authority, and “planned” means any project or activity that has been publicly disclosed prior to the issuance of the ToR or up to six months prior to the submission of the Project Application and the EIA report, whichever is most recent.

For the CEA, each of the environmental, social, economic, health, and land use components were evaluated, assessed and discussed where combined effects could reasonably be considered to result due to development of the Project in combination with other existing, approved and planned projects in the region. Industrial projects as well as activities associated with other land uses and infrastructure were included. Existing, approved and planned projects and activities in the region considered in the cumulative effects assessment are listed in [Table D.2-1](#).

<b>Table D.2-1 List of Existing, Approved and Planned (Reasonably Foreseeable) Projects</b>				
<b>Company</b>	<b>Project</b>	<b>Existing Activity (Baseline Case)</b>	<b>Approved Activity (Application Case)</b>	<b>Planned Activity (Reasonably Foreseeable) (CEA Case)</b>
<b>Mining Operations</b>				
CVRI	Coal Valley Mine	⊗		
	West Extension and South Block Areas	⊗		
	Mercoal East Phase 1 and 2 Areas	⊗		
	Gregg River Mine	⊗		
	Mercoal West and Yellowhead Tower Mine Areas		⊗	
	Robb Trend Mine Area			⊗
Elk Valley Coal Corp.	Luscar Mine	⊗		
	Cheviot Mine	⊗		
Coalspur Mines Ltd.	Vista Coal Project			⊗

<b>Table D.2-1 List of Existing, Approved and Planned (Reasonably Foreseeable) Projects</b>				
<b>Company</b>	<b>Project</b>	<b>Existing Activity (Baseline Case)</b>	<b>Approved Activity (Application Case)</b>	<b>Planned Activity (Reasonably Foreseeable) (CEA Case)</b>
<b>Timber Harvesting</b>				
West Fraser Mills Ltd.	Operations from 1954 to mid 2007	⊗		
	Operations to 2017 (10 years)			⊗
	Operations to 2032 (25 years)			⊗
	Operations to 2057 (50 years)			⊗
Sundance Forest Industries	Operations to mid 2007	⊗		
	Operations to 2017 (10 years)			⊗
	Operations to 2032 (25 years)			⊗
	Operations to 2057 (50 years)			⊗
<b>Other Projects</b>				
Oil and Gas	Gas Plants	⊗		
	Wellsites	⊗		
	Access Roads	⊗		
	Pipelines	⊗		
	Misc.	⊗		
Linear Disturbances	Powerlines	⊗		

### D.2.5 CUMULATIVE EFFECTS

The requirement to assess cumulative effects is legislated under both the *Alberta Environmental Protection and Enhancement Act* (EPEA) and the *Canadian Environmental Assessment Act* (CEAA).

In accordance with the ToR, CVRI identified the cumulative effects resulting from the Project when combined with those of other existing, approved and planned projects in the region. The CEA boundaries vary for each discipline. Existing, approved and planned projects in the region considered in the cumulative effects assessment are listed in [Table D.2-1](#).

### D.2.6 SIGNIFICANCE

An important step in environmental assessment is the determination of the significance of residual environmental effects. The CEA Agency has prepared a reference guide to assist proponents and project reviewers in determining whether a project is likely to cause significant adverse environmental effects (FEARO, 1994b). This reference document has been used for the Project EIA to assist in determining whether or not an environmental impact was deemed to be significant.

Significance is determined for predicted effects remaining after the incorporation of the planned environmental mitigative measures proposed for the Project. Predicted residual environmental effects are characterized in terms of the criteria recommended by the CEA Agency. These criteria include:

- magnitude;
- geographic extent;
- duration;
- frequency;
- reversibility; and
- ecological context.

The CEA Agency provides additional guidance regarding these criteria as follows:

### **Magnitude of the Impact**

“Magnitude refers to the severity of the adverse environmental effects. Minor or inconsequential effects may not be significant. On the other hand, if the effects are major or catastrophic, the adverse environmental effects will be significant. When using this criterion, it is important to consider the extent to which the project could trigger or contribute to any cumulative environmental effects.”

### **Geographic Extent**

"Localized adverse environmental effects may not be significant. Alternatively, widespread effects may be significant. When considering this criterion, it will be important to take into account the extent to which adverse environmental effects caused by the project may occur in areas far removed from it (*e.g.*, acid rain and the long-range transportation of atmospheric pollutants), as well as contribute to any cumulative environmental effects."

### **Duration and Frequency**

"Long term and/or frequent adverse environmental effects may be significant. Future adverse environmental effects should also be taken into account. For example, many human cancers associated with exposure to ionizing radiation have long latency periods of up to 30 years. Obviously when considering future adverse environmental effects, the question of their likelihood becomes very important."

### **Degree to which the Effects are Reversible or Irreversible**

"Reversible adverse environmental effects may be less significant than adverse environmental effects that are irreversible. In practice, it can be difficult to know whether the adverse environmental effects of a project will be irreversible or not. It will be important to consider any planned decommissioning activities that may influence the degree to which the adverse environmental effects are reversible or irreversible."

### **Ecological Context**

"The adverse environmental effects of projects may be significant if they occur in areas or regions that:

- have already been adversely affected by human activities; and/or
- are ecologically fragile and have little resilience to imposed stresses.”

### Environmental Standards, Guidelines, or Objectives

"If the level of an adverse environmental effect is less than the standard, guideline, or objective, it may be insignificant. If, on the other hand, it exceeds the standard, guideline, or objective it may be significant."

The factors used to assess the predicted environmental effects of the Project are specific to the VECs for each biophysical or socio-economic component. For example, the assessment of environmental effects and determination of significance for each VEC which is population based (e.g. fish, wildlife, vegetation) may not be applicable for those VECs which are not population based (e.g. air quality, groundwater). This Application identifies potential adverse effects and the assessment of their significance is presented in detail in the respective sections of the Application. Where possible, the determination of significance makes reference to existing standards, guidelines or recognized thresholds (e.g., *Alberta Ambient Air Quality Objectives*).

## D.3 STEPS IN THE ENVIRONMENTAL ASSESSMENT PROCESS

The overall approach to conducting the EIA for the Project is shown in [Table D.3-1](#) and later in this section.

<b>Basic EIA Steps</b>	<b>Tasks to complete for a CEA</b>
1. Scoping	Identify regional issues of concern
	Select appropriate regional VECs
	Identify spatial and temporal boundaries
	Identify other actions that may affect the same VECs
	Identify potential impacts due to actions and possible effects
2. Analysis of Effects and Identification of Mitigation	Complete the collection of regional baseline data
	Assess effects of proposed action on selected VECs
	Assess cumulative effects on selected VECs
	Recommend mitigation measures
3. Evaluation of Significance	Characterize residual effects
	Compare results against defined significance thresholds, such as standards, guidelines, land use objectives and trends, or other defined thresholds, and determine significance
4. Follow-up	Recommend monitoring and effect management

### D.3.1 SCOPING

The purpose of the scoping exercise was to identify issues of concern, the appropriate Project VECs and the study area boundaries. Issues of concern were identified based on:

- concerns expressed by stakeholders and the public including the scientific community, government departments and First Nations;

- EIA Terms of Reference;
- review of legislation;
- consideration of available reference material and literature;
- previous assessment experience including proposed developments in the Project study areas; and
- issues and concerns related to resources traditionally used by First Nations peoples.

Based on the evaluation of these issues, the Project VECs were identified. Generally, Project VECs were selected for analyses based on the extent of the interaction between the Project and the issue of concern. For some VECs, key questions were also developed to focus the assessment.

Throughout the EIA process, new VECs were identified and grouped into the appropriate resource discipline. Spatial and temporal boundaries for each resource discipline were established and other activities identified. A list of the VECs identified for the Project for each environmental discipline is presented in [Section E](#) and in the Consultant Reports.

### **D.3.2 ANALYSIS OF EFFECTS AND IDENTIFICATION OF MITIGATION**

Baseline conditions for each VEC were described, based on existing information and Project-specific investigations. Once baseline conditions for the resource were determined and Project activities were defined, an evaluation was carried out to determine whether environmental protection measures were required to mitigate impacts on the VEC.

The assessment of effects of the Project involved the prediction and evaluation of changes to VECs arising directly from the Project (*i.e.*, Project effects), as well as effects arising from the Project in combination with past, present and planned projects or activities (*i.e.*, cumulative effects).

The assessment of the effects of interactions between the Project and environment for each VEC is presented in tabular form for each discipline, as shown in [Table D.3-2](#). Assessment of potential Project-specific effects on the environment was based on a combination of objective (measurable) and subjective (deduced) evaluations that were specific to the VEC being considered. Potential residual effects of the Project were assessed for each phase of the Project including accidents and malfunctions.

The CEAA defines mitigation as “the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.”

Mitigation is often achieved through iterative Project design, for example through site selection to avoid sensitive areas and application of best practices during construction. Additional mitigation measures, over and above mitigation integrated into Project design, were identified for each effect, as required. Types of mitigation measures that were considered included:

- environmental protection measures and protocols;

- site-specific measures (*i.e.*, timing of activities to avoid biologically sensitive periods, site-specific mitigation design measures); and
- contingency measures to address the possibility of accidental events that could affect the environment.

The evaluation considered those mitigation measures which would be required to meet either regulatory, company or public acceptance during the planning, design, construction, operation and/or reclamation phases of the Project.

Once the residual Project-specific effects were characterized, the potential for these effects to act cumulatively with similar effects from other projects and human activities was assessed. If the residual effects of the Project were found to not overlap with similar effects from other past, present and reasonably foreseeable future projects, it was concluded that the Project would not contribute to cumulative effects, and no further analysis of cumulative effects was conducted. The determination of significance was then based only on the Project-specific residual effect.

If residual Project-specific effects were found to overlap with similar effects from other past, present and reasonably foreseeable future projects, a cumulative effects assessment was completed. It is important to note that a residual Project-specific effect does not have to be significant to trigger the need to assess cumulative effects. The main question the cumulative effects assessment sought to address was “will the Project contributions to regional cumulative environmental effects have the potential to measurably change the health or sustainability of the resource in question?”

### **D.3.3 EVALUATION OF SIGNIFICANCE**

For all VECs, except for socio-economic, predicted residual Project-specific and cumulative effects were characterized using the criteria described previously. The type of effect was determined and the environmental component's sensitivity to and ability to recover from the impact was also considered by evaluating the geographic extent, duration, magnitude and reversibility of the impact resulting from the Project activities.

The type of effect was determined and the environmental component's sensitivity to and ability to recover from the impact was also considered by evaluating the geographic extent, duration, magnitude and reversibility of the impact resulting from the Project activities. The evaluation criteria used for the Project is presented on [Table D.3-2](#). It should be noted that this table is general in nature but provides the details for the VEC tables.

For all VECs, except for socio-economic, each predicted residual Project-specific and cumulative effect was rated as either significant or insignificant. As noted previously, the determination of significance was made in reference to existing standards, guidelines or recognized thresholds, where these were available. Insignificant impacts were determined to be those residual effects:

- where the residual Project effect in combination with the existing baseline conditions is not predicted to result in the exceedance of established provincial or federal guidelines, thresholds or criteria;

- where the residual Project effect in combination with existing baseline conditions as well as future (disclosed) project effects is not predicted to result in the exceedance of established provincial or federal guidelines, thresholds or criteria; or
- where the residual Project effect occurs to a population or species in a localized manner, over a short period of time, and/or similar to natural variation, and/or which are reversible and have no measurable effects on the integrity of the population as a whole.

Where established standards, guidelines, or thresholds against which to evaluate significance were not available, a transparent, step-wise process was employed that utilizes the outcome of individual effects descriptors to arrive at an overall conclusion for significance.

Any predicted significant residual effect is discussed and placed into perspective. For each VEC, the effects assessment is summarized in tabular form. An example of a generic effects assessment summary is shown in [Table D.3-3](#). The detailed consultant reports provide further definition, where considered necessary, in order to assess the severity of the impact on the environmental component.

<b>Criteria</b>	<b>Criteria Definition</b>	
Geographic Extent of Impact	Local	Effects occurring mainly within or close proximity to the proposed development area.
	Regional	Effects extending outside of the project boundary to regional surroundings.
	Provincial	Effects extending outside of the regional surroundings, but within provincial boundary.
	National	Effects extending outside of the provincial surroundings, but within national boundary
	Global	Effects extending outside of national boundary.
Duration of Impact	Short	Effects occurring within development phase
	Long	Effects occurring after development and during operation of facility
	Extended	Effects occurring after facility closes but diminishing with time.
	Residual	Effects persisting after facility closes for a long period of time.
Frequency	Continuous	Effects occurring continually over assessment periods.
	Isolated	Effects confined to a specified period ( <i>e.g.</i> , construction)
	Periodic	Effects occurring intermittently but repeatedly over assessment period ( <i>e.g.</i> , routine maintenance activities).
	Occasional	Effects occurring intermittently and sporadically over assessment period
	Accidental	Effects occurring rarely over assessment period.
	Seasonal	Effects occurring seasonally.



<b>Table D.3-2 Evaluation Criteria for Assessing the Significance of the Environmental Impact of the Project</b>		
<b>Criteria</b>	<b>Criteria Definition</b>	
Ability for Recovery	Reversible in short-term	Effects which are reversible and diminish upon cessation of activities.
	Reversible in long-term	Effects which remain after cessation of activities but diminish with time.
	Irreversible - Rare	Effects which are not reversible and do not diminish upon cessation of activities and do not diminish with time.
Magnitude	Nil	No change from background conditions anticipated after mitigation.
	Low	Disturbance predicted to be somewhat above typical background conditions, but well within established or accepted protective standards and normal socio-economic fluctuations, or to cause no detectable change in ecological, social or economic parameters.
	Moderate	Disturbance predicted to be considerably above background conditions but within scientific and socio-economic effects thresholds, or to cause a detectable change in ecological, social or economic parameters within range of natural variability.
	High	Disturbance predicted to exceed established criteria or scientific and socio-economic effects thresholds associated with potential adverse effect, or to cause a detectable change in ecological, social or economic parameters beyond the range of natural variability.
Project Contribution	Neutral	No net benefit or loss to the resource, communities, region or province.
	Positive	Net benefit to the resource, community, region or province.
	Negative	Net loss to the resource, community, region or province.
Confidence Rating	Low	Based on incomplete understanding of cause-effect relationships and incomplete data pertinent to study area.
	Moderate	Based on good understanding of cause-effect relationships using data from elsewhere or incompletely understood cause-effect relationship using data pertinent to study area.
	High	Based on good understanding of cause-effect relationships and data pertinent to study.
Probability of Occurrence	Low	unlikely
	Medium	possible or probable
	High	certain

<b>Table D.3-3 Example Summary of Impact Significance on Valued Environmental Components (VECs)</b>												
VEC	Nature of Potential Impact or Effect	Mitigation /Protection Plan	Type of Impact or Effect	Geographical Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversability <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Significance <sup>9</sup>
<b>1. List the VEC</b>												
			Application									
			Cumulative									
<b>2. List the VEC</b>												
			Application									
			Cumulative									
<b>3. List the VEC</b>												
			Application									
			Cumulative									
<b>4. List the VEC</b>												
			Application									
			Cumulative									
<b>5 List the VEC</b>												
			Application									
			Cumulative									

- 1. Local, Regional, Provincial, National, Global
- 2. Short, Long, Extended, Residual
- 3. Continuous, Isolated, Periodic, Occasional, Accidental, Seasonal
- 4. Reversible in short term, Reversible in long term, Irreversible - rare
- 5. Nil, Low, Moderate, High
- 6. Neutral, Positive, Negative
- 7. Low, Moderate, High
- 8. Low, Medium, High
- 9. Insignificant, Significant

### D.3.4 FOLLOW-UP AND MONITORING

Once residual Project-specific environmental effects and their contribution to cumulative effects have been assessed, a follow-up program or monitoring program might be necessary. Follow-up programs are required to verify the accuracy of the environmental assessment of a project, and determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

Follow-up programs might be warranted when:

- there is a need to address project-related issues of public concern;
- there is a need to test the accuracy of the predictions of the environmental assessment;
- there is a need to verify that mitigation measures were effective or successful;
- environmental effects of a project were assessed using new or unproven analytical or modelling techniques or the proposed project involves technology or mitigation measures that are new or unproven;
- there is limited experience implementing the type of project being proposed in the environmental setting under consideration; or
- scientific knowledge used to predict the environmental effects of the proposed project is limited.

Follow-up programs can be time- and resource-intensive and are only required where there is an identified need for a program based on the criteria set out above. In some instances, a monitoring program might adequately address issues and ensure the environment is protected.

Monitoring typically refers to a program designed to:

- confirm the effectiveness of a broad range of approved mitigation techniques;
- determine whether increased or different approved mitigation techniques are required to achieve mitigation or reclamation goals; and
- identify and address actual effects that were not predicted.

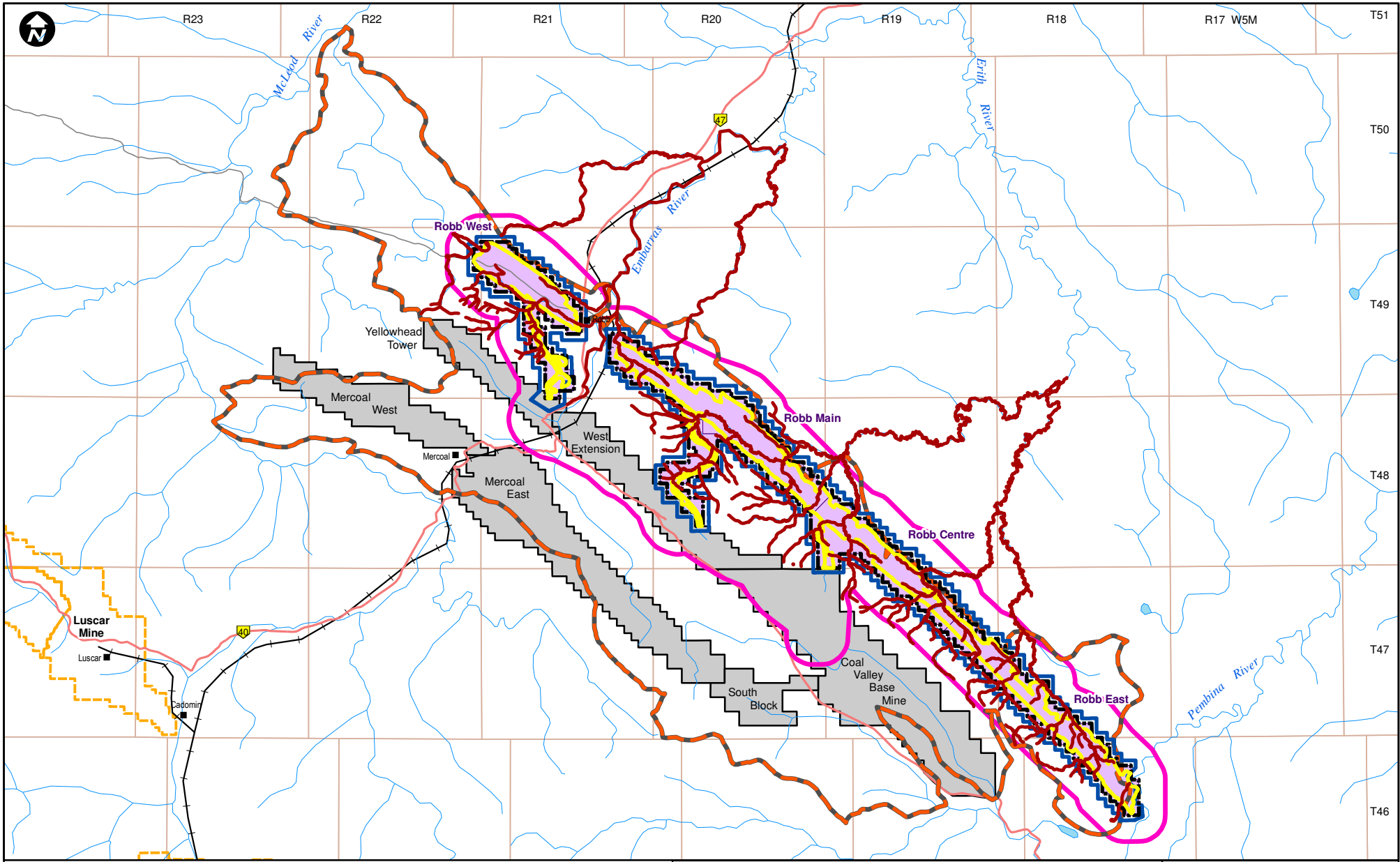
Recommended follow-up and monitoring programs are identified for specific disciplines in the following assessment. If a follow-up or monitoring program is recommended, recommendations are provided with respect to:

- parameters to be measured;
- methods and equipment to be used;
- location and timing of surveys; and
- how results of the follow-up or monitoring program will be applied, including consideration of an adaptive management approach.

## **D.4 APPLICATION OF THE METHODOLOGY**

Based on the above-described methodology, the EIA for the Project focused on the effects that the Project would have on the identified VECs in combination with other activities in the region over the anticipated economic life of the Project.

Based on the input received during the public consultation program, advice from regulatory agencies and the professionals working on the Project, CVRI is confident that the methodology and approach used to conduct the EIA has enabled a comprehensive and accurate assessment of the effects of the Project.

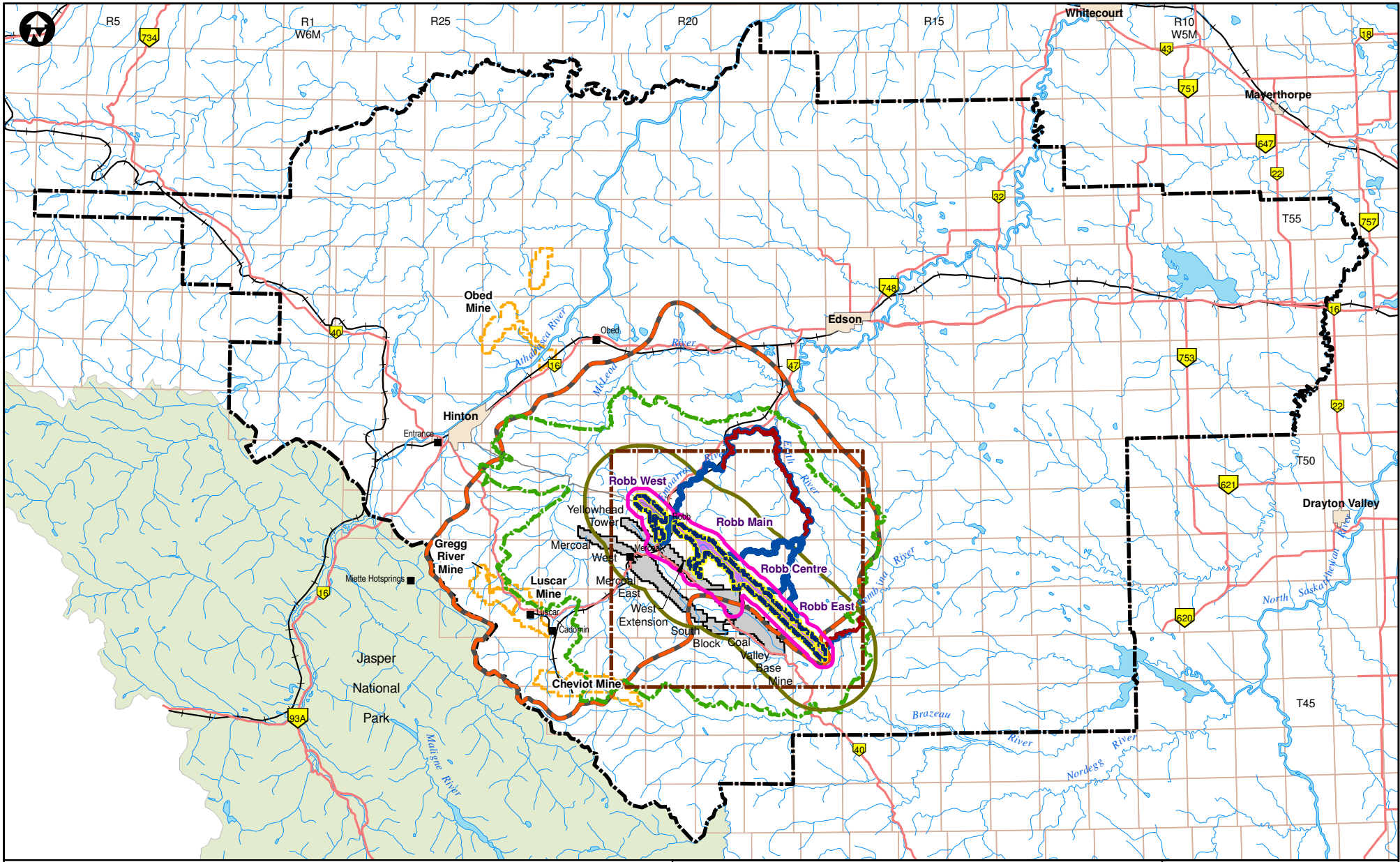


**Legend**

- Proposed Robb Trend Mine Permit Boundary
  - Existing Coal Valley Mine Permit Areas
  - Other Mines
- 0      3      6      12  
 Kilometres

- Local Study Area**
- Mammalian Carnivore, Groundwater, Historical Resources, Socio-Economic, Traditional Land Use, Vegetation, Wildlife
  - Fisheries
  - Hydrology
  - Noise
  - Soil
  - Surface Water Quality

<p>PROJECT:</p> <p style="text-align: center;"><b>Coal Valley Mine Robb Trend Project</b></p> <p>TITLE:</p> <p style="text-align: center;"><b>Local Study Areas</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: small;">DRAWN: SL</td> <td style="font-size: small;">FIGURE:</td> </tr> <tr> <td style="font-size: small;">CHECKED: KP</td> <td rowspan="3" style="font-size: large; vertical-align: middle;"><b>D.2.3-1</b></td> </tr> <tr> <td style="font-size: small;">DATE: Mar 7/12</td> </tr> <tr> <td style="font-size: small;">PROJECT: 08-041</td> </tr> </table>	DRAWN: SL	FIGURE:	CHECKED: KP	<b>D.2.3-1</b>	DATE: Mar 7/12	PROJECT: 08-041
DRAWN: SL	FIGURE:						
CHECKED: KP	<b>D.2.3-1</b>						
DATE: Mar 7/12							
PROJECT: 08-041							



**Legend**

- Proposed Robb Trend Mine Permit Boundary
- Existing Coal Valley Mine Permit Areas
- Other Mines

0 10 20 40  
Kilometres

**Regional Study Area**

- Air, Human Health
- Fisheries
- Groundwater
- Historical Resources
- Hydrology
- Mammalian Carnivore, Vegetation, Wildlife
- Noise
- Socio-Economic
- Soil
- Surface Water Quality

<p>PROJECT:</p> <p style="font-size: 1.2em;"><b>Coal Valley Mine Robb Trend Project</b></p> <p>TITLE:</p> <p style="font-size: 1.2em;"><b>Regional Study Areas</b></p>							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">DRAWN: SL</td> <td style="width: 50%;">FIGURE:</td> </tr> <tr> <td>CHECKED: KP</td> <td rowspan="3" style="font-size: 1.5em; text-align: center;"><b>D.2.3-2</b></td> </tr> <tr> <td>DATE: Mar 7/12</td> </tr> <tr> <td>PROJECT: 08-041</td> </tr> </table>	DRAWN: SL	FIGURE:	CHECKED: KP	<b>D.2.3-2</b>	DATE: Mar 7/12	PROJECT: 08-041	
DRAWN: SL	FIGURE:						
CHECKED: KP	<b>D.2.3-2</b>						
DATE: Mar 7/12							
PROJECT: 08-041							

# Robb Trend – VEC Tables

\*Historical Resources; Human Health; Noise; Socio-Economic; TLU; Greenhouse Gas and Climate Change; and Land and Resource Use did not require VEC tables for application purposes.

Table 1 Summary of Impact Significance on Air Quality Valued Environmental Components												
VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
1. NO <sub>2</sub> Concentration												
	Potential human health effects and odour	<a href="#">Section E.1.5</a>	Project Residual and Cumulative	Local	Long	Continuous	Reversible in long term	Moderate. Potential for odour at the Project permit boundary.	Negative	High (NO <sub>x</sub> emissions from combustion well understood)	High	Insignificant
2. SO <sub>2</sub> Concentration												
	Potential human health and vegetation effects	<a href="#">Section E.1.5</a>	Project Residual and Cumulative	Local	Long	Continuous	Reversible in long term	Low for short term; moderate for annual	Negative	High (sulphur content in fuel known)	High	Insignificant
3. Particulate Concentration												
	Potential human health effects and visibility impairment	<a href="#">Section E.1.5</a>	Project Residual and Cumulative	Local (adjacent to haul roads or active pits)	Medium	Continuous	Reversible in long term	Low for PM <sub>2.5</sub> and TSP; moderate for PM <sub>10</sub>	Negative	Moderate (greater uncertainty in fugitive emission factors and secondary PM formation)	High	Insignificant
4. CO Concentration												
	Potential human health effects	<a href="#">Section E.1.5</a>	Project Residual and Cumulative	Local	Long	Continuous	Reversible in long term	Moderate	Negative	High (CO emissions from combustion well understood)	High	Insignificant

**Table 1 Summary of Impact Significance on Air Quality Valued Environmental Components**

VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
										understood)		
5. Particulate Deposition												
	Potential vegetation effects and nuisance	Section E.1.5	Project Residual and Cumulative	Local (adjacent to haul roads or active pits)	Medium	Continuous	Reversible in long term	Moderate	Negative	Moderate (more uncertainty in deposition estimates)	High	Insignificant
6. Ozone Concentration												
	Potential human health effects	Based on management of precursors	Project Residual and Cumulative l	Regional	Long	Continuous	Reversible in long term	Low	Negative	Moderate (based on provincial scale modeling)	High	Insignificant
7. VOC and PAH Concentration												
	Potential human health effects and odour	Section E.1.5	Project Residual and Cumulative	Local	Long	Continuous	Reversible in long term	Moderate	Positive	Moderate (products of incomplete combustion less certain)	Medium	Insignificant
8. Metal Concentrations												
	Potential human and ecological health effects	Section E.1.5	Project Residual and Cumulative	Local (adjacent to haul roads)	Long	Continuous	Reversible in long term	Low	Negative/Positive	Moderate (contribution of crustal sources more variable)	Medium	Insignificant

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant



**Table 2 Summary of Impact Significance on Aquatic Resource Valued Environmental Components**

VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
<b>Rainbow Trout</b>												
	Habitat alteration, changes in surface hydrology, sedimentation and other changes in water quality	NNLP, Flow management, Surface water management plan, Construction timing, Fish salvage	Project	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Residual	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Cumulative	No cumulative effects as project contribution to effect can be fully mitigated								
<b>Bull Trout</b>												
	Habitat alteration, changes in surface hydrology, sedimentation and other changes in water quality	NNLP, Flow management, Surface water management plan, Construction timing, Fish salvage	Project	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Residual	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Cumulative	No cumulative effects as project contribution to effect can be fully mitigated								
<b>Arctic Grayling</b>												
	Sedimentation and other changes in water quality habitat alteration, changes in surface hydrology,	NNLP, Flow management, Surface water management plan, Construction timing, Fish salvage	Project	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Residual	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Cumulative	No cumulative effects as project contribution to effect can be fully mitigated								
<b>Benthic Invertebrates</b>												
	Habitat alteration, changes in surface hydrology, sedimentation and other changes in water quality	NNLP, Flow management, Surface water management plan	Project	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Residual	Local	Long	Occasional	Reversible	Low	Negative	High	Low	Insignificant
			Cumulative	No cumulative effects as project contribution to effect can be fully mitigated								

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

<b>Table 3 Summary of Impact Significance on Groundwater Valued Environmental Components</b>												
<b>VEC</b>	<b>Nature of Potential Impact or Effect</b>	<b>Mitigation/Protection Plan</b>	<b>Type of Effect</b>	<b>Geographic Extent<sup>1</sup></b>	<b>Duration<sup>2</sup></b>	<b>Frequency<sup>3</sup></b>	<b>Reversibility<sup>4</sup></b>	<b>Magnitude<sup>5</sup></b>	<b>Project Contribution (Direction)<sup>6</sup></b>	<b>Confidence Rating<sup>7</sup></b>	<b>Probability of Occurrence<sup>8</sup></b>	<b>Impact Rating<sup>9</sup></b>
1. Impacts on Water Wells												
	Wells in Robb	Water Well Replacement Policy	Project	Local	Short	None	R-ST	Low	Neutral	High	Moderate	Insignificant
			Residual	Local	Short	None	R-ST	Low	Neutral	High	Moderate	Insignificant
			Cumulative	Local	Short	None	R-ST	Low	Neutral	High	Moderate	Insignificant

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant- (No Impact, Low Impact, Moderate Impact), Significant (High Impact)

<b>Table 4 Summary of Impact Significance on Surface Hydrology Valued Environmental Components</b>												
<b>VEC</b>	<b>Nature of Potential Impact or Effect</b>	<b>Mitigation/Protection Plan</b>	<b>Type of Impact or Effect</b>	<b>Geographical Extent<sup>1</sup></b>	<b>Duration<sup>2</sup></b>	<b>Frequency<sup>3</sup></b>	<b>Reversibility<sup>4</sup></b>	<b>Magnitude<sup>5</sup></b>	<b>Project Contribution<sup>6</sup></b>	<b>Confidence Rating<sup>7</sup></b>	<b>Probability of Occurrence<sup>8</sup></b>	<b>Significance<sup>9</sup></b>
<b>1. Change in Runoff Due to Mine Construction and Operation</b>												
Changes in runoff due to haul roads	Section E.6.5	Application	Local	Long	Seasonal/Periodic	Reversible in the long-term	Moderate	Negative	High High			Insignificant
		Cumulative	Local	Long	Seasonal/Periodic	Reversible in the long-term	Low - Mod	Negative	High High			Insignificant
Changes in runoff due to Clearing and Logging	Section E.6.5	Application	Local	Long	Seasonal	Reversible in the long-term	Low – Mod	Negative	High	High		Insignificant
		Cumulative	Local	Long	Continuous/Seasonal	Reversible in the long-term	Low – Mod	Negative	High	High		Insignificant
Changes in runoff due to operation of Pits & Pit Dewatering	Section E.6.5	Application	Local	Long	Continuous	Reversible in the long-term	Low	Negative	High High			Insignificant
		Cumulative	Local	Long	Continuous	Reversible in the long-term	Low	Negative	High High			Insignificant
Changes in runoff due to Temporary Diversions	Section E.6.5	Application	Local	Short	Isolated	Reversible in the short-term	Nil	Neutral	High	High		Insignificant
		Cumulative	Local	Short	Isolated	Reversible in the short-term	Nil	Neutral	High	High		Insignificant
Changes in runoff due to Spoil Piles	Section E.6.5	Application	Local	Long	Seasonal	Reversible in the short-term	Low	Negative & Positive	Moderate	Medium		Insignificant
		Cumulative	Local	Long	Seasonal	Reversible in the short-term	Low	Negative & Positive	Moderate	Medium		Insignificant
<b>2. Change in Runoff After Reclamation and Closure</b>												
Construction of End Pit Lakes and Restored Channels	Section E.6.5	Application	Local	Residual	Continuous	Irreversible	Low-High	Negative & Positive	High	High		Significant
		Cumulative	Local	Residual	Continuous	Irreversible	Low-High	Negative & Positive	High	High		Significant
Changes in runoff due to Reclaimed Spoil Areas	Section E.6.5	Application	Local	Residual	Continuous	Reversible in the long-term	Low – Mod	Negative to Positive	Moderate	High		Insignificant
		Cumulative	Local	Residual	Continuous	Reversible in the long-term	Low - Mod	Negative to Positive	Moderate	High		Insignificant
<b>3. Change in Sediment Concentrations (Water Quality) Due to Mine Construction and Operation</b>												
Impact on sediment concentrations due to Haul Roads	Section E.6.5	Application	Local	Long	Periodic	Reversible in the long-term	Low	Negative	High High			Insignificant
		Cumulative	Local	Long	Periodic	Reversible in the long-term	Low	Negative	High High			Insignificant

**Table 4 Summary of Impact Significance on Surface Hydrology Valued Environmental Components**

VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Impact or Effect	Geographical Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Significance <sup>9</sup>
Impact on sediment concentrations due to Clearing and Logging	Section E.6.5	Application	Local	Long	Periodic	Reversible in the long-term	Low	Negative	High High		Insignificant	
		Cumulative	Local	Long	Periodic	Reversible in the long-term	Low	Negative	High High		Insignificant	
Impact on sediment concentrations due to Pit & Pit Dewatering	Section E.6.5	Application	Local	Long	Occasional/Isolated	Reversible in the short-term	Low	Negative	High M	Medium	Insignificant	
		Cumulative	Local	Long	Occasional/Isolated	Reversible in the short-term	Low	Negative	High M	Medium	Insignificant	
Impact on sediment concentrations due to Temporary Diversions	Section E.6.5	Application	Local	Short	Isolated	Reversible in the short-term	Nil	Neutral	High	High	Insignificant	
		Cumulative	Local	Short	Isolated	Reversible in the short-term	Nil	Neutral	High	High	Insignificant	
Impact on sediment concentrations due to Spoil Piles & Rock Drains	Section E.6.5	Application	Local	Long	Seasonal/Periodic	Reversible in the long-term	Low	Negative	Moderate	Medium	Insignificant	
		Cumulative	Local	Long	Seasonal/Periodic	Reversible in the long-term	Low	Negative	Moderate	Medium	Insignificant	
<b>4. Change in Sediment Concentrations (Water Quality) After Reclamation and Closure</b>												
Impact on sediment concentrations due to End Pit Lakes and Restored Channels	Section E.6.5	Application	Local	Residual	Periodic	Irreversible	Low-Moderate	Positive/Neutral	High	High	Insignificant	
		Cumulative	Local	Residual	Periodic	Irreversible	Low-Moderate	Positive/Neutral	High	High	Insignificant	
Impact on sediment concentrations due to Reclaimed Spoil Areas	Section E.6.5	Application	Local	Residual	Periodic	Reversible in the short-term	Low	Neutral	Moderate	Low	Insignificant	
		Cumulative	Local	Residual	Periodic	Reversible in the short-term	Low	Neutral	Moderate	Low	Insignificant	

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

Table 5 Summary of Impact Significance on Mammalian Carnivore Valued Environmental Components												
VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
<b>1. Marten</b>												
	Increased Mortality	Section E.7.5	Application	Local	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
	Habitat Alteration		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	High	Negative	High	High I	nsignificant
	Sensory Disturbance		Application	Regional	Long	Isolated	Reversible-ST	Low	Negative	Moderate	High	Insignificant
			Cumulative	Regional	Extended	Periodic	Reversible-ST	Low	Negative	Moderate	High	Insignificant
	Habitat Fragmentation		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	High	Negative	High	High I	nsignificant
Barriers to Movement	Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant		
	Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant		
<b>2. Fisher</b>												
	Increased Mortality	Section E.7.5	Application	Local	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
	Habitat Alteration		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Negative	High	High I	nsignificant
	Sensory Disturbance		Application	Regional	Long	Isolated	Reversible-ST	Moderate	Negative	Low	High	Insignificant
			Cumulative	Regional	Extended	Periodic	Reversible-ST	Low	Negative	Moderate	High	Insignificant
	Habitat Fragmentation		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	Moderate	High	Insignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Negative	Low	High	Insignificant
Barriers to Movement	Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	Moderate	High	Insignificant		
	Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Negative	Moderate	High	Insignificant		

Table 5 Summary of Impact Significance on Mammalian Carnivore Valued Environmental Components												
VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
<b>3. Lynx</b>												
	Increased Mortality	Section E.7.5	Application	Local	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
	Habitat Alteration		Application	Local	Extended	Continuous	Reversible-LT	Low	Positive	High	High Insignificant	
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Positive	High	High Insignificant	
	Sensory Disturbance		Application	Regional	Long	Isolated	Reversible-ST	Low	Negative	Moderate	High	Insignificant
			Cumulative	Regional	Extended	Periodic	Reversible-ST	Low	Negative	Moderate	High	Insignificant
	Habitat Fragmentation		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Positive	High	High Insignificant	
Barriers to Movement	Application	Local	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant		
	Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High I	nsignificant		
<b>4. Wolf</b>												
	Increased Mortality	Section E.7.5	Application	Local	Extended	Occasional	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Occasional	Reversible-LT	Low	Negative	Moderate	High	Insignificant
	Habitat Alteration		Application	Local	Extended	Continuous	Reversible-LT	High	Negative	High	High I	nsignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	High	Negative	High	High I	nsignificant
	Sensory Disturbance		Application	Regional	Long	Isolated	Reversible-ST	Low	Negative	Moderate	High	Insignificant
			Cumulative	Regional	Extended	Periodic	Reversible-ST	Low	Negative	Moderate	High	Insignificant
	Habitat Fragmentation		Application	Local	Extended	Continuous	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Positive	Moderate	Medium	Insignificant
Barriers to Movement	Application	Local	Extended	Continuous	Reversible-LT	Low	Negative	High	Medium	Insignificant		
	Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Negative	High	Medium	Insignificant		

Table 5 Summary of Impact Significance on Mammalian Carnivore Valued Environmental Components												
VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
<b>5. Grizzly Bear</b>												
	Increased Mortality	Section E.7.5	Application	Local	Extended	Occasional	Reversible-LT	Low	Negative	High	Low	Insignificant
			Cumulative	Regional	Extended	Occasional	Reversible-LT	High	Negative	High	Medium	Significant
	Habitat Alteration		Application	Local	Extended	Continuous	Reversible-LT	Moderate	Positive	High	High	Insignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Moderate	Negative	High	High	Insignificant
	Sensory Disturbance		Application	Regional	Long	Isolated	Reversible-ST	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Periodic	Reversible-ST	Low	Negative	High	Medium	Insignificant
	Habitat Fragmentation		Application	Local	Extended	Continuous	Reversible-LT	Low	Negative	High	Low	Insignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Negative	High	Low	Insignificant
	Barriers to Movement		Application	Local	Long	Isolated	Reversible-LT	Low	Negative	High	Medium	Insignificant
			Cumulative	Regional	Extended	Continuous	Reversible-LT	Low	Negative	High	Medium	Insignificant

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

<b>Table 6 Summary of Impact Significance on Soil &amp; Terrain Valued Environmental Components</b>												
<b>VEC</b>	<b>Nature of Potential Impact or Effect</b>	<b>Mitigation/Protection Plan</b>	<b>Type of Effect</b>	<b>Geographic Extent<sup>1</sup></b>	<b>Duration<sup>2</sup></b>	<b>Frequency<sup>3</sup></b>	<b>Reversibility<sup>4</sup></b>	<b>Magnitude<sup>5</sup></b>	<b>Project Contribution (Direction)<sup>6</sup></b>	<b>Confidence Rating<sup>7</sup></b>	<b>Probability of Occurrence<sup>8</sup></b>	<b>Impact Rating<sup>9</sup></b>
<b>SOILS</b>												
Disruption of natural soil landscapes	Soil salvage and reclamation of soil landscapes	Project	local 5,729 ha	short	continuous	reversible (long term)	high	negative	high	high	insignificant	
		Residual	local 5,729 ha	residual	continuous	reversible (long term)	low	neutral	high	high	insignificant	
		Cumulative	local 5,729 ha	residual	continuous	reversible (long term)	low	neutral	high	high	insignificant	
Loss of non-salvageable soil	Salvage best quality soil	Project	local 5,729 ha	short	isolated	irreversible	low	negative	high	high	insignificant	
		Residual	No residual effects noted									insignificant
		Cumulative	No cumulative effects noted									insignificant
Change in soil quality by mixing during salvage		Project	local 5,729 ha	short	periodic	reversible (long term)	low	neutral	high	high	insignificant	
		Residual	local 5,729 ha	residual	continuous	reversible (long term)	low	neutral	high	high	insignificant	
		Cumulative	No cumulative effects noted									insignificant
Accelerated erosion of minesoils causes loss of soil resource	Design and construct for erosion control	Project	local 5,729 ha	short	isolated	reversible (long term)	low	neutral	high	high	insignificant	
		Residual	local 5,729 ha	residual	isolated	reversible (long term)	low	neutral	high	high	insignificant	
		Cumulative	No cumulative effects noted									insignificant
Loss of soil landscape diversity	Build minesoil diversity	Project	local 5,729 ha	extended	continuous	reversible (long term)	low	neutral	high	high	insignificant	
		Residual	No residual effects noted									insignificant
		Cumulative	No cumulative effects noted									insignificant



<b>Table 6 Summary of Impact Significance on Soil &amp; Terrain Valued Environmental Components</b>												
<b>VEC</b>	<b>Nature of Potential Impact or Effect</b>	<b>Mitigation/Protection Plan</b>	<b>Type of Effect</b>	<b>Geographic Extent<sup>1</sup></b>	<b>Duration<sup>2</sup></b>	<b>Frequency<sup>3</sup></b>	<b>Reversibility<sup>4</sup></b>	<b>Magnitude<sup>5</sup></b>	<b>Project Contribution (Direction)<sup>6</sup></b>	<b>Confidence Rating<sup>7</sup></b>	<b>Probability of Occurrence<sup>8</sup></b>	<b>Impact Rating<sup>9</sup></b>
<b>LAND CAPABILITY</b>												
Loss of land capability and future production	Reclaim to meet land use goals	Project	local 5,729 ha	short	continuous	reversible	moderate	negative	high	high	insignificant	
		Residual	local 5,729 ha	extended	continuous	reversible	moderate	neutral	high	high	insignificant	
		Cumulative	local 5,729 ha	extended	continuous	reversible	moderate	neutral	high	high	insignificant	
Delay in returning capability and diversity	Successional reclamation	Project	local 5,729	short	continuous	reversible	moderate	negative	high	high	insignificant	
		Residual	local 5,729 ha	extended	isolated	reversible	moderate	neutral	high	high	insignificant	
		Cumulative	No cumulative effects noted									insignificant
Climate change causes increased moisture deficits	None required	Project	No project effects noted									insignificant
<b>OVERBURDEN CHARACTERISTICS</b>												
Increased trace element concentrations	Not adverse effects – no mitigation required	Project	No project effects noted									insignificant

(1) Local, Regional, Provincial, National, Global

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(3) Continuous, Isolated, Periodic, Occasional  
(Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

**Table 7 Summary of Impact Significance on Surface Water Quality Valued Environmental Components**

VEC	Nature of Potential Impact or Effect	Mitigation/Protection Plan	Type of Effect	Geographic Extent <sup>1</sup>	Duration <sup>2</sup>	Frequency <sup>3</sup>	Reversibility <sup>4</sup>	Magnitude <sup>5</sup>	Project Contribution (Direction) <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Occurrence <sup>8</sup>	Impact Rating <sup>9</sup>
<b>1. Surface Water Quality</b>												
	Changes in Surface Water Quality from Construction Activities	Section E.11.5	Application	Local	Short	Isolated	Reversible, Short-term	Low	Negative	High	High	Insignificant
				Regional	Short	Isolated	Reversible, Short-term	Low	Negative	High	High	Insignificant
			Planned Development	Local	Short	Isolated	Reversible, Short-term	Low	Negative	High	High	Insignificant
				Regional	Short	Isolated	Reversible, Short-term	Low	Negative	High	High	Insignificant
	Changes in Surface Water Quality from use of Nitrogen-Based Explosives	Section E.11.5	Application	Local	Long	Periodic	Reversible, Long-term	Low	Negative	High	High	Insignificant
				Regional	Long	Periodic	Reversible, Long-term	Low	Negative	High	High	Insignificant
			Planned Development	Local	Long	Periodic	Reversible, Long-term	Low	Negative	High	High	Insignificant
				Regional	Long	Periodic	Reversible, Long-term	Low	Negative	High	High	Insignificant
	Changes in Surface Water Quality from Operation of Project Impoundments	Section E.11.5	Application	Local	Extended	Occasional	Reversible, Long-term	Low	Negative	High	High	Insignificant
				Regional	Extended	Occasional	Reversible, Long-term	Low	Negative	High	High	Insignificant
			Planned Development	Local	Extended	Occasional	Reversible, Long-term	Low	Negative	High	High	Insignificant
				Regional	Extended	Occasional	Reversible, Long-term	Low	Negative	High	High	Insignificant
	Water Quality of End-Pit Lakes	Section E.11.5	Application	Local	Residual	Continuous	Irreversible	Low	Neutral	High	High	Insignificant

(1) Local, Regional, Provincial, National, Global

(2) Short, Long, Extended, Residual

(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

<b>Table 8 Summary of Impacts on Vegetation and Wetlands Valued Environmental Components</b>												
VEC	Nature of Potential Effect	Mitigation / Protection Plan	Type of Effect	Geographical Extent of Effect <sup>1</sup>	Duration of Effect <sup>2</sup>	Frequency of Effect <sup>3</sup>	Ability for Recovery from Effect <sup>4</sup>	Magnitude of Effect <sup>5</sup>	Project Contribution <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Effect Occurrence <sup>8</sup>	Significance <sup>9</sup>
<b>1. Terrestrial Vegetation/Plant Communities (Ecosite Phases)</b>												
	Reduction in Plant Community Types & Area	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	High	Neutral	Moderate	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	High	Neutral	Moderate	High	Insignificant
<b>2. Rare Plants, Rare Plant Communities and Rare Plant Potential</b>												
	Removal of Rare Species, Communities & Potential	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Moderate	Neutral	Low	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Moderate	Neutral	Low	High	Insignificant
<b>3. Wetlands</b>												
	Reduction in Types & Area	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	Low	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	Low	High	Insignificant
<b>4. Old Growth Forests</b>												
	Removal of Old Growth Forests	Section E.13.5	Application	Local	Extended	Isolated	Reversible Long Term	Low	Neutral	High	High	Insignificant
			Cumulative	Local	Extended	Isolated	Reversible Long Term	Low	Neutral	High	High	Insignificant
<b>5. Non-native and invasive species</b>												
	Spread of Invasive & Non-native Species	Section E.13.5	Application	Local	Extended	Periodic	Reversible Long Term	Low	Neutral	High	High	Insignificant
			Cumulative	Local	Extended	Periodic	Reversible Long Term	Low	Neutral	High	High	Insignificant
<b>6. Traditionally Used Plants</b>												
	Removed from Footprint	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Moderate	Neutral	High	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Moderate	Neutral	High	High	Insignificant

Table 8 Summary of Impacts on Vegetation and Wetlands Valued Environmental Components												
VEC	Nature of Potential Effect	Mitigation / Protection Plan	Type of Effect	Geographical Extent of Effect <sup>1</sup>	Duration of Effect <sup>2</sup>	Frequency of Effect <sup>3</sup>	Ability for Recovery from Effect <sup>4</sup>	Magnitude of Effect <sup>5</sup>	Project Contribution <sup>6</sup>	Confidence Rating <sup>7</sup>	Probability of Effect Occurrence <sup>8</sup>	Significance <sup>9</sup>
<b>7. Biodiversity</b>												
	Reduction in Genetic-Species Diversity	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Low	Negative	Moderate	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	Moderate	High	Insignificant
	Reduction of Community Diversity	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	High	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	High	High	Insignificant
	Reduction of Landscape Diversity	Section E.13.5	Application	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	High	High	Insignificant
			Cumulative	Local	Extended	Continuous	Reversible Long Term	Low	Neutral	High	High	Insignificant

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(3) Continuous, Isolated, Periodic, Occasional (Accidental, Seasonal)

(4) Reversible in short term, Reversible in long term, Irreversible – rare

(5) Nil, Low, Moderate, High

(6) Neutral, Positive, Negative

(7) Low, Moderate, High

(8) Low, Medium, High

(9) Insignificant, Significant

**Table 9 Determination of the Significance of Potential Effects of the Proposed Project on Wildlife Resources (Ungulates, Small Mammals, Breeding Birds, Raptors, and Amphibians).**

VEC	Nature of Potential Impact	Mitigation/Protection Plan	Type of Effect	Criteria for Determining Significance						Significance	Project Contribution	Confidence Rating
				Extent	Duration	Frequency	Recovery	Magnitude	Probability			
<b>UNGULATES (Moose, Deer, Elk)</b>												
Elk	Loss of Foraging Habitat	Minimize Loss (2) Reclamation (1, 9,10,12,17,18)	Project	Local	Grassland Development (Extended)	Continuous	Reversible in Short-Term	Moderate	High	Significant	Positive	High
	Loss of Forest Cover	Minimize Loss (2) Reclamation (9,10)	Residual	Local	Shrub Development (Long) Forest Development (Long )	Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	High
Moose	Loss of Foraging Habitat	Minimize Loss (2) Reclamation (1, 7, 8, 10, 11, 16)	Project	Local	Shrub Development (Long)	Continuous	Reversible Long-Term	Low	High	Insignificant	Neutral	Moderate
	Loss of Forest Cover	Minimize Loss (2) Reclamation (1, 7, 8, 11, )	Residual	Local	Forest Development (Long)	Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	High
Deer	Loss of Foraging Habitat	Minimize Loss (2) Reclamation (1, 7, 8, 9,10,11,12,16)	Project	Local	Grassland Development (Extended) Shrub Development (Long)	Continuous	Reversible in Short-Term	Moderate	High	Significant	Positive	High
	Loss of Forest Cover	Minimize Loss (2) Reclamation (9,10)	Residual	Local	Forest Development (Long)	Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	High

**Table 9 Determination of the Significance of Potential Effects of the Proposed Project on Wildlife Resources (Ungulates, Small Mammals, Breeding Birds, Raptors, and Amphibians).**

VEC	Nature of Potential Impact	Mitigation/Protection Plan	Type of Effect	Criteria for Determining Significance						Significance	Project Contribution	Confidence Rating
				Extent	Duration	Frequency	Recovery	Magnitude	Probability			
Elk Moose Deer	Disruption of Movement Patterns	Minimize Loss (2) Reclamation (15)	Project	Local	Short	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
		Management (18)	Project	Local	Short	Continuous	Reversible in Short-Term	Moderate	High	Insignificant	Neutral	Moderate
Elk Moose Deer	Displacement	Management (17,18)	Project	Regional	Long	Continuous	Reversible in Long-Term	Moderate	Medium	Insignificant	Neutral	Moderate
Elk Moose Deer	Direct Mortality	Training (5)	Project	Local	Short	Continuous	Irreversible	Low	High	Insignificant	Neutral	High
<b>SMALL MAMMALS</b>												
	Loss of Habitat	Minimize Loss (2) Reclamation (1,7,8, 9, 10, 11, 15,16)	Project	Local	Grassland Development (Extended)	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
						Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	Moderate
					Shrub Development (Long) Forest Development (Long)							

**Table 9 Determination of the Significance of Potential Effects of the Proposed Project on Wildlife Resources (Ungulates, Small Mammals, Breeding Birds, Raptors, and Amphibians).**

VEC	Nature of Potential Impact	Mitigation/Protection Plan	Type of Effect	Criteria for Determining Significance						Significance	Project Contribution	Confidence Rating
				Extent	Duration	Frequency	Recovery	Magnitude	Probability			
<b>BREEDING BIRDS and RAPTORS</b>												
	Loss of Habitat	Minimize Loss (2) Reclamation (1, 7, 8, 9, 10, 11, 12, 13, 16)	Project and Residual	Local	Grassland Development (Extended)	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
			Project	Local	Shrub Development (Long)	Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	Moderate
		Management (18)	Project	Local	Forest Development (Long)	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
					Short							
	Direct Mortality	Timing & Training (3, 4, 6)	Project	Local	Short	Continuous	Irreversible	Low	High	Insignificant	Neutral	High
	Displacement	Minimize Loss (2) Reclamation (1, 7, 8, 9, 10, 11, 12, 13, 16)	Project and Residual	Local	Grassland Development (Extended)	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
			Project	Local	Shrub Development (Long)	Continuous	Reversible in Long-Term	Low	High	Insignificant	Neutral	Moderate
		Management (18)	Project	Local	Forest Development (Long)	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High
					Short							
<b>AMPHIBIANS</b>												
	Loss of Habitat	Minimize Loss (2) Reclamation (1, 13)	Project	Local	Short	Continuous	Reversible in Short-Term	Low	High	Insignificant	Neutral	High

**ESRD Appendix 11**

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A COMPARATIVE REVIEW OF THE ROBB TREND  
AND COAL VALLEY MINE





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## **A Comparative Review Robb Trend and Coal Valley Mine**

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June 2013  
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Appendix A – Figures

## 1.0 INTRODUCTION

During the Supplemental Information Request (SIR) process for the Coal Valley Resources Inc. (CVRI) Robb Trend application, it was stated that CVRI contends that the hydrogeologic environment and the groundwater regimes found in the Robb Trend Project (the Project) area are similar to the conditions that have been encountered during mining operations located to the southwest in the adjacent Coal Valley Mine (CVM) area. Giving that the conditions are similar, CVRI has stated in the application that potential impacts and the significance of the impacts regarding groundwater quality and dewatering can be predicted by the historical precedents from CVM and that mitigation strategies used successfully at CVM can be applied to the Robb Trend Project.

Throughout the Robb Trend application, the documents do not specifically address the number of similarities in the two mining areas through the use of existing data. In response to that assertion, the Government of Alberta has requested that CVRI prove through a detail response that the geological and hydrogeological conditions found at CVM and the proposed Robb Trend Project are indeed similar.

Using the conceptual system developed by Toth in 1970 of a hydrogeologic environment and groundwater regime to compare and contrast the existing CVM and proposed Project, the purpose of this document is to show that the groundwater regimes of Robb Trend are similar to that experienced at CVM.

Through examples from previous studies and experience at CVM, CVRI will show that dewatering activities will have minimal and short term effects on the groundwater available to support surface baseline flow of the creeks and streams as well as local wetlands.

### 1.1 Similar and Identical

CVRI has used the terms similar and identical, often interchangeably. In a geologic context, something is similar if it has been formed and subjected to the same processes and forces. For example, two samples of sandstone obtained from an area may have been formed in the same high energy fluvial environment, undergone millions of years of similar forces and stresses and been subject to the same water, temperature and wind erosional processes, but may have slightly different characteristics such as strength or hydraulic permeability. From a geologic perspective, these sandstone samples could be called similar but are not identical.

To assist in understanding CVRI assertion that the CVM and Robb Trend Project are similar, it is helpful to keep the definition presented in mind – that the groundwater regimes are similar in both areas because they have been formed in a similar manner and have been influenced by the same processes.

## 1.2 The Hydrogeologic Environment

The “hydrogeologic environment” is a conceptual system of those morphologic, geologic, and climatologic parameters that determine the principal attributes of the “groundwater regime” in a given area (Tóth 1970, 1999). The six main attributes or parameters of the groundwater regime are:

- water content of the rocks;
- geometry of the flow systems;
- specific volume discharge;
- chemical composition of the water;
- temperature; and
- the variations of all these parameters with respect to time.

These parameters of the groundwater regime are controlled by the three components of the hydrogeologic environment, namely the topography, geology and climate, as described below.

### 1.2.1 Topography

Topography determines the amount of energy available to the water for motion at any given point in a drainage basin, *i.e.*, the topographic relief determines the distribution of the flow-inducing energy for the water and shapes the boundaries of the flow domain. The environmental components are made up of various parameters, such as the size and shape of topographic depressions and prominences, and orientation and frequency of geomorphic features.

### 1.2.2 Geology

The geology provides the conduit system for water movement, which controls the possible amounts, rates and patterns of flow, and the distribution and amount of stored water. Geology also determines the chemical constituents and may contribute local or regional sources of energy by, for instance, compaction, compression, or heat. The various environmental parameters such as soluble mineral content, configuration of lithological and structural features of different permeabilities, *e.g.*, stratification, lenticularity, faulting, fractures, and degree of anisotropy control the conduit system.

### 1.2.3 Climate

Climate controls the temperature and water availability to the hydrogeological regime. The climatologic factors determine the amounts and distribution of the water supplied to any region, the temperature, amount, type, and seasonal variation of precipitation and potential evaporation.

### **1.3 Groundwater Regime**

In order to show that the groundwater regimes at CVM and the Robb Trend Project are similar as they exist in the same hydrogeologic environment, comparisons of hydraulic conductivity, transmissivity, and water levels are presented in this report.

It is recognized that static conditions in two distinct areas may appear similar, and differences in conditions only become apparent when there is a disturbance. Pit dewatering and pumping test examples will show that the hydrogeologic response to disturbances (primarily dewatering) are similar across the study area.

## **2.0 HYDROGEOLOGIC ENVIRONMENT AT COAL VALLEY**

### **2.1 Topography and Drainage**

Topography in the two existing mining trends varies from significant uplands to low wetlands. There is a definite tendency of drainage courses to follow parallel to the trends – likely due to the lesser resistance to erosion offered by the Coalspur Formation relative to the Paskapoo and Brazeau Formations. These “in trend” drainage courses connect to less frequent, but more significant drainage courses that cross the trends transversely.

Robb Trend consists of a similar mix of relatively elevated and relatively low lying land that is drained in substantial part by water courses within the trend and crossed infrequently by more-major streams.

The Pembina River flows along the southeast end of both the Coal Valley to Yellowhead Tower trend and the Robb Trend. The Embarrass River crosses both the Coal Valley to Yellowhead Tower trend and the Robb Trend.

### **2.2 Geology**

#### **2.2.1 Regional Overview**

The CVM including the proposed Robb Trend Project is situated along the eastern edge of the Rocky Mountain Foothills physiographic region, approximately 100 km south of Edson, Alberta ([Figure 1](#)). The foothills consist of a series of northwest to southeast striking folds and predominately shallow, west dipping thrust faults that developed 70 to 150 million years ago during the Cretaceous Period. The pattern of deformation increases westward in complexity from the shallow, open Alberta Syncline at the start of the foothills, to the tightly folded and faulted strata immediately east of the Nikanassin Thrust at the base of the Rocky Mountains.

### 2.2.2 Geologic Structure of the CVM and Robb Trend Project Area

The CVM area is structurally complex, lying between and aligned with the Coalspur Anticline to the northeast and with the Lovett and Entrance Synclines to the southwest. The CVM is bounded on the southwest by the east dipping Mercoal thrust and the west dipping Beaver Dam thrust and to the northeast by the east dipping Pedley thrust. Numerous other similar thrust faults such as the Val d'Or thrust are also found.

The Pedley Thrust is located west of the Robb Trend Project and marks the eastern edge of the foothills region and divides the Entrance and Alberta Synclines. The Robb Trend Project is located on the western limb of the Alberta Syncline and will be exploiting the same coal seams as those found in the current and past mining areas. The Robb Trend Project is not as structurally complex as that in previous mining areas since it is situated on the outer edge of the foothills with no further low angle thrust faults identified to the east (Figure 2).

The three trends that make up the CVM and Robb Trend Project are a series of folds having a "wave length" of approximately 12 km. The sole difference from a structural point of view is that bedding dips to the east for Robb Trend and Mercoal/South Extension and westward for Coal Valley Main and Yellowhead Tower. The magnitude of these dips does not appear to change significantly between the trends.

Coal seams strike northwest to southeast with dips oriented to the northeast. Topography is moderate with steep ridges and flat bottomed valleys oriented parallel to the coal seam strikes. The main Val d'Or Seam is often found on the top or slope of a ridge due to the stronger sandstones surrounding it. The lower seams, such as Mynheer are often located in valley floors of the base of slopes due to the more easily erodible strata in proximity to those seams. The coal seams are generally consistent over long strike lengths. Shallow thrust faults cut through the area in sympathy with major thrust faults. Local over-thickening of coal seams may be found.

The stratigraphic column that applies to the entire area of the CVM is:

- sandstones and mudstones of the Paskapoo Formation of the Tertiary Period , overlying;
- the Coalspur Formation of Cretaceous / Tertiary Periods consisting of sandstone, siltstone bentonitic mudstone and coal. The coal seams in this formation are the target of mining activity in the two existing mines as well as the Robb Trend, overlying;
- the Cretaceous Period Entrance Conglomerate – a thin unit composed of conglomerate and sandstone, overlying; and
- the Brazeau Formation of Cretaceous age consisting of sandstone, mudstone, conglomerate and bentonitic beds.



All of these formations contain rocks of similar description with the exception of the appearance of mineable coal seams in the Coalspur Formation.

Generally, mining activity may disturb the surficial deposits and the Paskapoo and Coalspur Formations. It is uncommon for the Entrance and the Brazeau Formations to be disturbed as they lie below the coal.

Within the CVM area, the farthest southwest trend of the Coalspur Formation corresponds to the South Extension / Mercoal East and West mining areas of CVRI. The Coalspur to Coal Valley trend of the Coalspur Formation corresponds to the Coal Valley, West Extension and Yellowhead Tower portions of CVRI. The northeast trend of the Coalspur Formation corresponds to the proposed Robb Trend Project.

### **2.2.3 Robb Trend Project Geology**

The geology of the Robb Trend Project has major similarities to the current CVM operating area, such as the geologic strata and the overall structure. The area contains multiple coal seams oriented as moderate to steeply dipping monoclines.

The Project is a long thin development area with a strike length of approximately 50 km. Over this length some 'depositional' variations can be noted from one end to the other. Thickness of coal seams and partings do vary to a minor degree as well as seam separations and interburden thickness.

While the geology of the Robb Trend Project is very similar to the CVM operating area, some differences include:

- The Val d'Or and Arbour Seam complex. Within the western portion of the Robb Trend Project, these seams are found as a combined mineable zone. Toward the east portion of the Robb Trend Project, the Arbour seam becomes much thinner and is separated below the Val d'Or. In these circumstances the mineability of the Arbour Seam is much less certain. In the current mining area, the Arbour Seam is separated some distance below the Val d'Or Seam and is relatively 'dirty'. It has not been considered mineable due to its position and high ash content.
- Additional coal seams are found to be mineable in locations throughout the Robb Trend Project. These seams include McLeod and McPherson Seams which have not been recoverable in the current CVM area. The areas where these seams become sufficiently thick and of good quality have been included in the mine reserve. Likewise, the Silkstone Seams (Wee and Bourne) are considered mineable in some locations.

- The dip of the various seams can differ significantly over the strike length of the Project. The dip of the strata holds a significant influence over the geotechnical capability of highwall and footwall material. Once the dip reaches specific limits, the bedding dip in footwall materials become more influential in the footwall design. Likewise, joint sets in the highwall reach more significant influence in bench face stability.

The stratigraphic and lithological characteristics of the two existing mine areas and the proposed mining area are the same.

#### **2.2.4 Geologic Cross Sections**

Six cross sections through the area were created to assist in showing that the geology of the CVM and Robb Trend Project is similar. The location of each section is shown on [Figure 4](#). The sections are presented A through F ([Figures 7-12](#)). Each section presents the overburden and bedrock geology in the area of each trend.

The cross sections show that the overall geology is consistent throughout the mining area. A thin layer of overburden overlies a dipping sequence of bedrock starting with the Paskapoo Formation overlying the coal bearing Coalspur Formation which overlies the Brazeau Formation.

From a hydrogeologic environment standpoint, while dip direction of bedrock changes as the geology of the CVM mine transitions from a synclinal structure to an anticline, and that the sequence of minable coal seams differs, the similarity is enough to generate similar groundwater regimes throughout all three trends.

#### **2.2.5 Climate**

Climate controls the temperature and water availability to the hydrogeological regime. Climate will not be measurably different between the two existing mining trends and that of the Robb Trend.

### **2.3 Hydrogeologic Environment Discussion**

If Toth's ascertain is correct that groundwater regimes are directly influenced by the hydrogeologic environment, then from a regional perspective, the CVM and proposed Robb Trend Project areas are influenced by the same topography, geology and climate. Given that the project areas are adjacent, it is reasonable to draw the conclusion that they have the same hydrogeologic environment and thus will develop very similar groundwater regimes.

### 3.0 GROUNDWATER REGIMES

The six main attributes, or parameters of the groundwater regime (Toth, 1970) are:

1. water content of the rocks;
2. geometry of the flow systems;
3. specific volume discharge;
4. chemical composition of the water;
5. temperature; and
6. the variations of all these parameters with respect to time.

The objective of most groundwater investigations are to determine some, if not all, of these attributes through geological interpretation, pumping tests, groundwater level measurements, and chemical sampling. On-going monitoring assists with an understanding of the temporal nature of the regime.

#### 3.1 Previous Investigations

Coal mining in the Coal Valley area took place between the early 1900's and the 1950's. CVM began operations in 1978. A considerable number of groundwater investigations were conducted during the 1970's and early 1980's to investigate dewatering issues, water supply and slope stability. Therefore, CVRI has a broad range of historical reports and information which assists in having *apriori* knowledge to understand and predict the response of groundwater in the area to certain inputs.

These investigations were reported in the following documents:

- Hardy Associates (1978) Ltd. (1980);
- Hydrogeological Consultants Ltd. (1977);
- Luscar Ltd., (undated-a) and (undated-b);
- Luscar Sterco (1977) Ltd. (1979);
- MLM Ground-Water Engineering Ltd., (1979), (1981), (1982);
- Mobile Augers and Research Ltd., (1975), (1977); and
- R.M. Hardy & Associates Ltd., (1975a), (1975b), (1976).

Groundwater levels, groundwater chemistries and/or hydraulic conductivity values are available in these reports. During the 1990's, monitoring of groundwater levels and chemistries was implemented in piezometers installed specifically for this purpose adjacent to some pits.

Figure 4 shows the areas studied compared to the existing CVM and proposed Robb Trend Project. Note that a number of the historical studies are in the Robb Trend Project proposed footprint.

### **3.2 Groundwater Regimes in the Coal Valley Area.**

Two primary groundwater regimes exist in the area. The first is the Quaternary and surficial groundwater regimes. Highly controlled by topography and glacially deposited material, these shallow regimes are mostly responsible for the observed surface water conditions and water inputs in the surface water bodies. These regimes are generally localized and can vary widely across the entire area.

The second is the regional or bedrock groundwater regime. This regime is controlled by the structure and geology of the bedrock. Regionally scaled structures such as folding, thrusts and faults, along with the composition of the various geologic formations, control the direction of flow and quantity of groundwater available for water supply. Recharge and discharge zones may be tens of kilometers apart or in some cases, water entering recharge areas becomes essentially trapped in the geologic structure.

It is important to note that the interactions between the two regimes occur continuously; however, the overall influence on one regime to another is generally marginal.

#### **3.2.1 Quaternary and Surficial Groundwater Regime**

Quaternary and surficial geology in the area are usually glacially derived. These types of deposits tend to be:

- thin glacial till in upland areas; and
- thin till overlain by muskeg or peat in the lowlands.

In most topographic settings, the surficial deposits tend to be thin. It is common for local streams to have a thin unconsolidated substrate over shallow bedrock.

Wetlands, ponds, fens and drainage courses that may contain ephemeral water are controlled by this regime. Precipitation in the form of rainfall or snowmelt contribute greatly to the quantity of water available in this regime. Therefore, topography and climate play a significant role in sustaining this regime.

#### **3.2.2 Regional Groundwater Regime**

Previous mining areas and the mining areas planned for the Robb Trend Project will occur in the same geological units as the current CVM. These geologic units include the upper Cretaceous to Tertiary sediments of the Paskapoo Formation. The Val d'Or, Arbour, Silkstone and Mynheer seams are the coal-bearing formations. Structurally, these seams lie in a parallel series of eroded anticlines and synclines that are reflected in the layout of the various mining areas. Specifically:

- The syncline (the upper limbs of which have been eroded) lies between the Coal Valley – Yellowhead Tower mining areas and the South Extension (aka South Extension) – Mercoal West mining areas.
- Underground mines have been present in this syncline in the vicinity of Foothills, Sterco and Mercoal.
- The anticline (the crest of which has been eroded) lies between the Coal Valley – Yellowhead Tower mining areas and the Robb Trend.
- With the exception of very localized structural features, the dip of the coal in the Robb Trend Project is northeast.

From a topographic point of view:

- The Coal Valley – West Extension - Yellowhead Tower mine operations are on elevated land with adjacent lowlands to the northeast and southwest.
- The South Extension – Mercoal West mine operations are on relatively low land which contains a central watercourse and adjacent minor up Geology is the controlling factor in the regional groundwater regime lands.

In the case of the regional groundwater regime, geology is the controlling factor.

#### **4.0 GROUNDWATER CONDITIONS AT COAL VALLEY**

The amount of groundwater in the area available for various uses such as surface water recharge (groundwater discharge) or for water supply is controlled by a number of factors such as:

- hydraulic conductivity of the material (material type, porosity, and connectivity);
- storativity (the volume of water released from storage per unit decline in hydraulic head) of the material; and
- and hydraulic gradient (geologic structure and topography).

The following discussion will show that for both the existing CVM and the proposed Robb Trend Project, the hydraulic conductivity and the corresponding transmissivity values throughout the area are similar. This infers that the quantity of groundwater available for discharge within Robb Trend will be similar to that experienced at CVM. Furthermore, a review of groundwater levels both from CVM and Robb Trend will show that the natural fluctuations measured to date in the Robb Trend monitoring wells are similar to those measured in the CVM monitoring wells.

#### 4.1 Groundwater Flow and Velocity

Similar to surface water drainage in the foothills, groundwater flow in the area generally trends west to east and downward from the topographic high. [Figure 4](#) is an excerpt from Alberta Research Council Hydrogeological Map Edson Alberta 83F (ARC 1972). This figure presents a cross section which encompasses the Coal Valley area. The cross section shows that groundwater flows from topographic highs downward, and generally moves eastward. Groundwater recharge (downward direction of flow from the water table) occurs throughout most of this area. Groundwater discharge (upward direction of flow at the water table) occurs over a very limited area in topographic lows containing water courses (MEMS, 2008).

Environmental assessments for various stages of expansion of the CVRI operations (Luscar 1999; MEMS 2008) have documented groundwater flow directions. These studies have consistently indicated that shallow groundwater moves from upland areas to adjacent lowlands, and that only a small portion of groundwater participates in larger-scale flow systems beyond that of the local scale.

Groundwater flow direction is controlled by factors such as topography and geologic structure. Water prefers to move through higher permeable material or fractures but there must be a hydraulic gradient to drive the flow.

Groundwater velocity is controlled by the hydraulic conductivity (which is discussed in detail in Section 4.2), hydraulic gradient and effective porosity. It will be shown that the average hydraulic conductivity in the area is on the order of  $3.0E-6$  m/s. Using this average value, a hydraulic gradient of 1 (1 m decrease of water level for 1 m distance) and an effective porosity of 30% (which is typical for unconsolidated, uncemented sand), water velocity is 315 m per year. In bedrock which has lower hydraulic conductivity values, less gradient and effective porosity, groundwater flow velocity is less than a meter per year.

In a regional context, groundwater flow directions and velocity is predictable and known through the mapping conducted by the Alberta Research Council. Within local areas, groundwater flow direction in the shallow groundwater regime is controlled by the local topography while within the regional context, water will move towards the southeast following the geologic structure and lithology.

Figure 5 presents two hydrogeologic cross sections, one through the Mercoal East trend (Section 11300E) and other through Robb Trend (Section 11400E). The geology of the two sections is similar although the Robb Trend contains more mineable coal seams. Groundwater flow directions for both sections are the same. Groundwater flow in the Paskapoo Formation is south (mine grid), while groundwater in the Coalspur is southward with some upward component as flow is controlled by the geologic structure. On the southside of the Coalspur Formation, groundwater in the Brazeau

Formation is northerly again with some upward component. Similar topography and geologic structure and lithology will produce similar groundwater flow conditions.

#### **4.2 Hydraulic Conductivity and Transmissivity**

Hydraulic conductivity (K) is a coefficient of proportionality describing the rate at which water can move through a permeable medium. It is a function of the porous medium and the fluid and is generally presented in m/sec. Transmissivity is a measure of how much water can be transmitted horizontally and is directly proportional to horizontal hydraulic conductivity.

In basic terms, the smaller the coefficient, the more difficult it is for groundwater to flow. Factors such as matrix size (clay or sand particles), matrix porosity (the empty space between grains) and porosity connectivity (are the pores in connection with each other allowing fluid to flow) define the hydraulic conductivity of a material.

Groundwater flow is thus dependent on this coefficient as well as the hydraulic gradient. Also noted is that the velocity of groundwater flow is dependent on the material with the lowest hydraulic conductivity. Within complex bedrock, depositional and structural environment, as well as fracture patterns, can influence the groundwater flow velocity and direction. Within complex bedrock, fracture patterns, depositional and structural environment can influence the groundwater flow velocity and direction.

Similar hydraulic conductivity values between the two areas will show that the conditions controlling groundwater flow velocity and quantity are known and predictable throughout the area.

Throughout the history of groundwater investigations conducted on the CVM, estimates for at least 74 hydraulic conductivity values have been calculated. The hydraulic conductivity information was compiled and presented in Luscar (2005).

It was noted that within the CVM, there was a million-fold range of hydraulic conductivity. This range is not unusual given the fact that the nature of the rock can range from solid, intact strata to collapsed coal seams in abandoned underground workings (MEMS, 2012A).

[Table 1](#) shows a comparison of hydraulic conductivity values between the CVM monitoring wells and the Robb Trend monitoring wells. The mean value for both areas are the same order of magnitude. The maximum value noted for CVM is likely due to a groundwater well installed in a highly permeable formation for either dewatering or water source use. Also presented are the hydraulic conductivity values for several studies conducted in the area

Mine Area	Minimum Value (m/s)	Mean Value (m/s)	Maximum Value (m/s)	Standard Deviation	No. of Samples
Coal Valley Mine	3.4E-9	2.9E-6	3.7E-3	N/A	74
Robb Trend	3.7E-11	4.0E-6	4.8E-5	9.5E-6	62
<b>Hydraulic Conductivity Results from other Studies</b>					
Vista Project	3.0E-8	3.7E-7	3.3E-6	---	---
Coalspur Project	1.0E-9	---	5.0E-6	---	---
Construction Camp	1.0E-6	---	1.0E-5	---	---

Standard deviation was not presented in the Luscar (2005) report.

#### 4.2.1 Hydraulic Conductivity at the Vista Project

At the Vista Project located near Hinton AB is mining the same Coalspur Formation coal as the CVM. A review of the range of hydraulic conductivity values calculated for the surficial deposits is generally consistent with expected values for the given material types. The range of hydraulic conductivity values calculated for the glacial till is a few orders of magnitude, but values of  $2.0 \times 10^{-6}$  or lower are typical. These hydraulic conductivities are the same as the till in the CVM area which shows consistency over a broad region.

At the Vista Project, six hydraulic conductivity tests completed on sandstone or siltstone units within the Coalspur Formation indicate a range from  $3.0E-8$  m/s to  $3.3E-6$  m/s with a geometric mean value of  $3.7E-7$  m/s (MEMS 2012B). Again, comparison of the data for Vista to that of CVM shows consistency of values throughout the Coalspur formation.

A constant rate pumping test was conducted for 96.5 hours in a well completed in a sandstone unit overlying the Val d'Or seam. A transmissivity of  $84 \text{ m}^2/\text{day}$  was determined from the analysis of the pumping test.

#### 4.2.2 Hydraulic Conductivity at the Coalspur Project

In 1982, Dentherm Resources Limited (Dentherm) applied for an environmental approval for the Coalspur Project. The location of the former proposed Coalspur Project area overlies the Robb Trend Project area extending from Hamlet of Robb southeastward (Figure 4). Dentherm concluded that within their study area, hydraulic conductivity values ranged from  $1.0E-9$  m/s in the Mynheer Footwall to  $5.0E-6$  m/s in the McPherson Footwall and McPherson and Mynheer Coal seams.

Dentherm further states that the groundwater flow in the bedrock is controlled by local surface topography and by the highly anisotropic nature of the dipping rock strata. Dentherm identified four



distinct hydrogeologic units; two of which were confined aquifers and two were aquitards. They further state that the surficial sediments and upper weathered bedrock surface area are at least one order of magnitude more permeable than the most permeable rock units (Dentherm 1982).

Piteau (1982) reports that many regional wells had been pump tested for periods of between three and six hours. Approximate transmissivity values were estimated from time-drawdown curves. Of 21 pump tests studied, the transmissivity ranged between 0.0864 m<sup>2</sup>/day and 86.4 m<sup>2</sup>/day with a median value of 2.59 m<sup>2</sup>/day.

#### **4.2.3 Hydraulic Conductivity at a Planned Construction Camp Groundwater Supply Study**

An evaluation of local hydrogeological parameters was prepared at a proposed construction camp location just northwest of Foothills, AB by Hydrogeological Consultants Ltd. (HCL) in 1977 (Figure 4). The evaluation was located in the area of the current CVM plant site. In the 1977, HCL report, the calculated hydraulic conductivity values ranged between 1.0E-6 m/s and 1.0E-5 m/s. The calculated transmissivity values were between 164.2 m<sup>2</sup>/day and 233.3 m<sup>2</sup>/day. The test well was installed in a fractured, grey sandstone at a depth of 42.7 m (Piteau 1982).

### **4.3 Groundwater Levels**

Previous investigations have demonstrated that levels of groundwater in all three trends fluctuate. In a review of groundwater levels, it was noted that the levels fluctuate:

- Very little in lowland settings – with the order of magnitude being less than one metre.
- Widely in upland settings – several metres to tens of metres are observed.

In the following sections, the water levels in a number of monitoring wells from both CVM and the Robb Trend Project are shown. Data presented include the minimum, average, and maximum water levels recorded and also include the range observed and the standard deviation.

#### **4.3.1 Coal Valley Mine Groundwater Levels**

Groundwater levels at Coal Valley Mine have been monitored on a regular basis since the mine's inception. The locations of the monitoring wells are shown in Figure 6. Groundwater levels will fluctuate naturally due to inputs or lack of from rainfall and snow melt events. Table 2 shows the minimum, average, maximum and the calculated standard deviation of the groundwater levels in 62 monitoring wells. In general, many of the monitoring wells show a standard deviation of less than 2 m of fluctuation indicating that there has been very little influence from the mining activities.

**Table 2 Range of Groundwater Levels for CVM Piezometers**

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
YT-11-10-04A	1375.10	1375.10	1375.10	0.00	0.00
YT-18	1259.50	1259.50	1259.50	0.00	0.00
YT-11-10-01A	1365.78	1365.88	1365.98	0.20	0.14
YT-11-10-03	1374.04	1374.15	1374.26	0.22	0.16
YT-22	1173.21	1173.42	1173.74	0.53	0.18
YT-20A	1240.75	1241.01	1241.35	0.60	0.23
YT-13	1172.79	1173.10	1174.17	1.38	0.26
YT-14	1180.43	1181.00	1181.74	1.31	0.33
YT-21A	1237.57	1237.90	1238.43	0.86	0.35
YT-21B	1237.21	1237.55	1238.10	0.89	0.35
YT-17	1252.48	1252.79	1253.53	1.05	0.39
YT-11A	1310.94	1311.66	1312.51	1.57	0.40
YT-11-10-04B	1373.49	1373.79	1374.09	0.60	0.42
#6026	1335.65	1337.12	1337.50	1.85	0.42
YT-15	1236.21	1236.74	1237.65	1.44	0.45
YT-01A	1262.26	1262.96	1264.23	1.97	0.52
YT-12	1308.24	1309.86	1310.65	2.41	0.54
YT-04	1267.37	1268.19	1269.62	2.25	0.61
#6027	1337.80	1338.62	1339.60	1.80	0.61
YT-10A	1318.12	1319.21	1320.85	2.73	0.62
YT-11-10-02	1341.09	1341.55	1342.00	0.91	0.64
YT-01	1263.40	1263.97	1266.40	3.00	0.66
YT-20B	1223.47	1224.55	1225.32	1.85	0.71
#20	1344.80	1346.72	1348.13	3.33	0.77
YT-11	1310.43	1312.25	1313.15	2.72	0.78
#13	1344.82	1345.93	1347.82	3.00	0.91
YT-03A	1274.39	1278.89	1279.30	4.91	1.04
YT-08	1329.83	1332.29	1334.22	4.39	1.15
#12	1342.40	1345.86	1347.04	4.64	1.19

**Table 2 Range of Groundwater Levels for CVM Piezometers**

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
YT-19	1239.29	1240.65	1242.34	3.05	1.26
YT-05	1276.44	1279.18	1281.41	4.97	1.40
FH-02	1456.00	1460.73	1462.60	6.60	1.43
FH-02A	1456.33	1460.95	1462.93	6.60	1.44
YT-07A	1347.45	1348.80	1354.29	6.84	1.56
YT-02A	1272.82	1273.71	1277.37	4.55	1.64
YT-05A	1276.76	1279.70	1283.34	6.58	1.71
YT-07	1343.84	1346.59	1350.37	6.53	1.75
YT-03	1273.40	1276.81	1279.63	6.23	1.81
FH-01	1457.33	1461.88	1465.23	7.90	1.82
YT-06	1343.88	1348.48	1351.24	7.36	1.82
YT-16	1246.12	1248.68	1251.05	4.93	1.87
YT-10	1310.56	1319.28	1323.02	12.46	1.91
YT-02	1273.52	1275.87	1277.77	4.25	1.92
#4	1321.70	1324.28	1326.25	4.55	2.03
#1	1322.32	1324.68	1326.12	3.80	2.06
#6024	1329.61	1334.58	1336.20	6.59	2.10
FH-03	1446.76	1451.16	1455.30	8.54	2.26
FH-03A	1447.15	1452.17	1458.69	11.54	2.52
FH-05	1456.70	1458.13	1471.03	14.33	2.57
YT-09	1315.01	1317.88	1328.64	13.63	3.25
YT-11-10-01B	1358.36	1360.68	1363.00	4.64	3.28
YT-06A	1341.62	1350.26	1355.27	13.65	3.78
#6025	1320.81	1329.33	1333.40	12.59	3.91
FH-04A	1458.05	1461.19	1472.52	14.47	4.12
#3	1316.83	1327.87	1332.97	16.14	4.29
#6	1316.44	1326.93	1332.81	16.37	4.39
#5	1314.00	1322.47	1328.90	14.90	4.45
#19	1333.05	1340.84	1349.47	16.42	4.86

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
#2	1320.50	1325.81	1334.10	13.60	5.20
#18	1330.56	1339.82	1349.43	18.87	5.92
#17	1333.70	1342.91	1349.96	16.26	6.36
FH-04	1442.27	1457.22	1472.44	30.17	7.80

#### 4.3.2 Robb Trend Project Groundwater Levels

In comparison, a similar table ([Table 3](#)) for the Robb Trend monitoring wells comprising 47 locations shows that one standard deviation is generally less than 1 m although in a few locations, is calculated to be as great as 5.13 m (RT-22-40).

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
RT-01-30	1148.30	1148.30	1148.30	0.00	0.00
RT-20-40	1200.50	1200.50	1200.50	0.00	0.00
RT-04-45	1147.43	1147.51	1147.52	0.09	0.04
RT-24-50	1156.81	1156.84	1156.88	0.07	0.04
RT-04-20	1147.05	1147.14	1147.20	0.15	0.07
RW-03B-75	1192.47	1192.53	1192.58	0.11	0.08
RT-01-75	1147.56	1147.76	1147.80	0.24	0.10
Lower Robb 2	1105.09	1105.24	1105.36	0.27	0.14
RT-09-60	1141.30	1141.43	1141.58	0.28	0.14
RW-06A-30	1114.18	1114.28	1114.44	0.26	0.14
RT-09-15	1141.32	1141.54	1141.75	0.43	0.22
RW-02B-75	1195.85	1196.23	1196.54	0.69	0.35
RT-10-20	1141.30	1141.72	1142.16	0.86	0.43
Lower Robb 1	1106.16	1106.69	1106.95	0.79	0.46
RT-12-15	1185.72	1186.19	1186.64	0.92	0.46
Upper Robb 2	1093.24	1093.72	1094.21	0.97	0.49

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
Upper Robb 1	1095.04	1095.72	1096.17	1.13	0.60
RT-16-25	1249.57	1250.49	1251.40	1.83	0.67
RT-14-15	1208.69	1209.74	1210.51	1.82	0.71
RW-03A-30	1189.03	1189.63	1190.48	1.45	0.76
RW-01A-30	1205.82	1206.49	1207.32	1.50	0.76
RT-06-50	1183.55	1184.50	1185.34	1.79	0.90
RT-14-70	1210.28	1211.54	1212.86	2.58	0.91
RW-01B-75	1205.02	1205.73	1206.76	1.74	0.91
RT-07-70	1132.91	1133.81	1134.75	1.84	0.92
RT-15-70	1237.37	1238.27	1239.84	2.47	0.95
RT-10-70	1143.05	1143.68	1144.77	1.72	0.95
RT-07-20	1118.59	1119.59	1120.52	1.93	0.97
RT-17-90	1253.65	1255.41	1256.57	2.92	0.99
RT-18-30	1257.30	1258.97	1260.40	3.10	1.02
RT-15-20	1237.59	1238.51	1240.10	2.51	1.03
RT-08-60	1160.63	1161.64	1162.74	2.11	1.06
RW-06B-75	1109.36	1110.13	1111.36	2.00	1.07
RW-02A-30	1204.66	1205.54	1206.91	2.25	1.20
RT-17-25	1252.70	1254.51	1256.39	3.69	1.33
RT-13-50	1189.47	1191.03	1191.83	2.36	1.35
RT-12-70	1188.29	1189.50	1191.29	3.00	1.58
RT-26-50	1173.51	1175.50	1177.81	4.30	2.17
RT-25-50	1165.58	1168.10	1170.53	4.95	2.48
RT-21-40	1185.40	1187.34	1190.56	5.16	2.81
RT-23-40	1153.43	1155.48	1159.14	5.71	3.17
RW-05A-30	1109.84	1113.55	1116.34	6.50	3.25
RT-19-15	1267.23	1271.65	1276.35	9.12	3.49
RW-05B-75	1109.19	1113.21	1116.64	7.45	3.68
RT-19-70	1265.57	1271.22	1275.70	10.13	3.68
RT-11-40	1186.63	1189.87	1195.56	8.93	4.94

<b>Piezometer</b>	<b>Minimum Elevation (masl)</b>	<b>Average Elevation (masl)</b>	<b>Maximum Elevation (masl)</b>	<b>Range (m)</b>	<b>Standard Deviation (m)</b>
RT-22-40	1126.66	1130.54	1136.35	9.69	5.13

While not a rigorous comparison, the average standard deviation from the observations at CVM is 1.83 m while Robb Trend is 1.25 m. Given that some monitoring wells in CVM have been subject to drawdown due to mining activities, it is reasonable to expect a slightly larger range in the standard deviation as some the CVM wells presented were specifically installed to monitor a dewatering event. However, the conclusion that water levels fluctuate naturally in all three trends is valid.

## 5.0 PREVIOUS PIT DEWATERING AND PUMPING TESTS

This section will correlate a number of past events that CVM has experienced which demonstrate that drawdown of groundwater levels from dewatering activities or pumping tests have been similar regardless of the location of the pit or test area and that groundwater levels have recovered to pre-dewatering levels generally within a year of the cessation of dewatering or pumping activities. Pit dewatering examples include Pit 120 and Pits 123/143. Pumping tests were conducted at Pit 14 and at the former Coalspur Project. The locations of the pits and pumping tests are shown on [Figure 6](#).

Mine pits in the CVM area are usually dewatered by pumping from collection sumps. During this process, groundwater and precipitation entering the pit are pumped to a nearby holding pit for storage or an impoundment for treatment prior to release. A key characteristic of this method of controlling water is that drawdown in the water table adjacent to the active pit will never be lower than the elevation of the base of the collection sump. If dewatering were to occur through the use of water wells, the drawdown in the water table adjacent to an active pit could be lowered more. Therefore, it is unusual for water wells to be used in the dewatering process. The dewatering method used at CVM creates a maximum drawdown approximately equal to the depth of the pit below the water level. Pumping or aquifer tests are conducted by pumping groundwater from one well at a steady rate for a given period of time and measuring the water level in the pumping well and often in nearby observation water wells. As groundwater is pumped, the pressure in the aquifer decreases, and as a result, the water level in the aquifer can be lowered. This decline in water level is referred to as drawdown, or a change in hydraulic head. A cone of depression forms radially outward from the pumping well and drawdown may be measured in nearby observation wells. Drawdown in the aquifer is dependent on various factors, but generally, drawdown decreases with distance from the

pumping well. The pumping rate and length of time for pumping will also affect the drawdown in the aquifer.

Analyses of the aquifer test data from the pumping well and observation well(s) can provide aquifer parameters such as hydraulic conductivity, transmissivity, specific storage, specific yield and may also determine if hydrogeologic boundaries are present.

### 5.1 Pit 120

Pit 120 is located in the South Block mining area which is to the southwest of the existing mine site, across Highway 40. The east end of the pit borders on the Center Creek drainage and the west end of the pit is adjacent to the Lovett River (Figure 6).

In August 2003, at the MP1 mine area, Pit 120 came within 500 m of the Hydrogeological Section 22,284. The pit was approximately 25 m deep in this area. As a result of dewatering, the drawdown at the pit walls could be considered to be approximately 25 m.

At the time of the September 17, 2003 measurement, Pit 120 E was nearly at the line of section. This would mean that the advancing face of the pit was almost 500 m away in mid-August. At the time of the December 8, 2003 water level measurements, Pit 120E extended approximately 1,500 m west of the line of section. All of the water levels in the piezometers of Hydrogeological Section 22,300 show declining water levels between undisturbed conditions on September 30, 2002 and apparently disturbed conditions on December 8, 2003 (Figure 10). As of July, 2004 (330 days), operations were no longer taking place in Pit 120 and in-pit dewatering had ceased for several months. Water levels in July were all higher than eleven months earlier.

The table below provides detail information about the drawdown at Pit 120.

Days past August 15, 2003	Drawdown in Pit (m)	Drawdown (m) at Piezometer No.			
		FH-04	FH-03	FH-05	FH-02
Distance from pit wall (m)	0	180	220	280	420
0 Days	0	0	0	0	0
30 days	25	-12	-1	0	-1
120 days	25	-18	-4	-1	-1
330 days	0	1	1	3	2
Natural Fluctuation (m)	N/A	30	8	14	6

Table 4 states that after approximately 30 days of pit dewatering (to a depth of 25 m) and a distance of 500 m from the section line, the drawdown 180 m from the pit may have been as much as 12 m. There was no drawdown measured at distances of over 280 m from the pit. After 120 days of the pit being within 500 m, the drawdown may have been up to 18 m at 180 m distance and less than the observed natural fluctuations at distances beyond 220 m. Groundwater levels in the vicinity of the operating pit returned to static conditions in less than 300 days from first impact.

The information collected for Pit 120 shows that drawdown measured as a result of dewatering activities is not widespread (on the order of 200 m) and that water levels in the aquifer returned to static levels after dewatering ceased.

## 5.2 Mercoal West – Pit 123 and Pit 143

In August 2011, MEMS prepared a report (MEMS 2011) to provide a detailed assessment of the effects of pit dewatering in the vicinity of Hydrogeological Cross Section 4,000 East (the Cross Section) near Mercoal (Figure 6). The location of the monitoring wells and the two pits are presented on Figure 14. The Cross Section contains eight piezometers ranging in depth from 20 to 60 m located at six sites between 250 m south of Pit 143 to 300 m north of Pit 123. Monitoring of these piezometers was annually prior to 2009 but the monitoring frequency was increased to approximately monthly in 2009 and 2010 while nearby mining operations were active. The effects of dewatering are assessed over the period of July 2006 through May 2011.

The lowest elevation of the base of Pit 123 (Figure 15) in the vicinity of the Cross Section was 1315 m, which makes the pit approximately 60 m deep. The lowest elevation of Pit 143 in the vicinity of the Cross Section was 1305 m, which makes this pit approximately 45 m deep.

Natural, undisturbed groundwater conditions existed in this area up to approximately the end of 2008. Pit 123 advanced (moving southeast to northwest) to within 500 m of the Cross Section in early 2009. Operations commenced in Pit 143 later in 2009, with advancement southward, away from the Cross Section.

Piezometer (MER)	Elevation of Tip (m)	Distance from (m) [direction]		Drawdown post-June 2009		Recovery	
		Pit 123	Pit 143	(m)	%*	%	Months
MER 11	1310	300 [N]	na	3	<10	100	9
MER 12	1325	<50 [N]	na	14	30	50	9
MER 13	1305	100 [S]	300 [N]	0.5	Nil	100	2



Piezometer (MER)	Elevation of Tip (m)	Distance from (m) [direction]		Drawdown post-June 2009		Recovery	
		Pit 123	Pit 143	(m)	%*	%	Months
MER 14-2	1325	300 [S]	100 [N]	3	<10	80	8
MER 14-1	1310	300 [S]	100 [N]	<1 ? frozen	Nil ?	100	5
MER 15-2	1340	na	100 [S]	4	<10	100	6
MER 15-1	1310	na	100 [S]	4	<10	100	4
MER 16	1330	na	250 [S]	2	<5	100	4

Because dewatering is done with drainage to sumps located within the pits and subsequent pumping to external ponds the maximum lowering of the water level that can be accomplished is to the bottom of the respective pit. Therefore, the minimum elevation of the water level at Pit 123 and Pit 143 would have been 1315 and 1305 m respectively. These potential water level elevations may be compared directly to the water level elevations observed in the piezometers as shown on [Figure 15](#). Note that the minimum water level measured was in MER 12 at approximately 1326 masl in October 2010.

Within this groundwater regime, the data show significant drawdown was only measured within distances of approximately tens of metres from a mine pit. A drawdown of 30% of the possible 45 m of drawdown available in the pit was observed at MER 12, which is located less than 50 m from Pit 123. Three piezometer sites located approximately 100 m from the two pits showed drawdown of less than 10% of the possible 45 m of available drawdown. The area between adjacent pits, where the influence of water level decline from both pits might be the greatest, piezometers at distances as close as 100 m showed negligible effect.

Recovery of water levels to nearly pre-disturbance conditions occurs within 4 to 9 months after mining ceases, with the exception of MER 12 which was located closest to a pit. It is likely that natural seasonal fluctuations are influencing this conclusion at sites where the drawdown caused by mining is small. Seasonal fluctuation could be significant relative to a drawdown of only several metres. Resulting water levels may be permanently changed in the immediate vicinity of an approved end-pit lake however the distances of impact noted above are likely to remain valid.

When pit dewatering is occurring during the operational stages of mining, there is no significant decline in groundwater levels except in the immediate vicinity of the mine pit area. Any minor effects that do occur are mitigated in the post-operational condition when the pumps are turned off. The selection of water level elevation in any end pit lake will determine the maximum elevation of

groundwater levels within tens of metres of the lake and has no significant effect beyond that distance.

### 5.3 Pit 14 Dewatering

In 1979, CVM retained MLM Ground-Water Engineering (MLM) to study issues arising with groundwater in the eastern end of Pit 14 (now included in Pits 13 and 15) and to assist with dewatering the upper 37 m of overburden (Figure 6). MLM conducted a pumping test to assist in designing an appropriate dewatering system (MLM 1979). The pumping test lasted for 7070 minutes (~118 hrs) and the recovery was measured for 1100 minutes (~18 hours).

Conclusion from the pumping test were that the extent of high permeability area is limited by the coal pod and likely fracture termination within the sandstone. In the area of Pit 14, a hydraulic connection exists between the Upper Sandstone and the Lower Sequence and that dewatering of the Upper Sandstone units will have some effect on the lower one. Water level recovery in the sandstone is very rapid and that computer analysis suggested that the area can be dewatered in relatively short periods of time.

### 5.4 Coalspur Project Pumping Tests

In 1981, D.R. Piteau and Associates carried out two pumping tests on behalf of Dentherm as part of a geotechnical assessment to assist with a feasibility study (Piteau, 1982). The purpose of the tests were to determine the hydraulic conductivity and storativity values for a low permeability zone comprised of the McPherson Coal Seam and the strata underlying this seam.

The pumping tests were eight and nine days duration, respectively. In pump test #1, two observation piezometers located distances of 16 m and 34 m from the pumping well showed only 0.4 m of drawdown, even though the water level in the pumping well was lowered by approximately 90 m. Piteau calculated a hydraulic conductivity of  $3.0E-7$  m/s and a transmissivity of  $2.16$  m<sup>2</sup>/day.

For pump test #2, a step test was conducted in order to determine a suitable pumping rate. Upon completion of the step test, the water levels in the pumping well and associated monitoring wells were monitored. Within three weeks, the water levels in the pumping well and the monitoring wells recovered to the pre-test water level. Thirteen monitoring wells were installed and monitored during pump test #2. During the constant rate pumping test, Piteau reported that eight of the 13 piezometers showed significant response while three showed no response and two showed limited response.

Piteau calculated that the average horizontal (along bedding) hydraulic conductivity was  $1.6E-7$  and the transmissivity was  $0.865$  m<sup>2</sup>/day. Structural analysis indicated a well-developed joint set orthogonal to bedding. Piteau states that analysis of the results indicate low vertical (normal to

bedding) permeability, and suggest that these joints are not very continuous or are very tight, due to high stresses, hence allowing very little vertical groundwater flow.

### **5.5 Dewatering Conclusion**

CVRI experience in pit dewatering shows a consistent trend in two key areas. Groundwater levels show a natural variation of up to 5 m as shown in the Robb Trend Project groundwater level data (Table 3). The distance from a pit dewatering event that the drawdown of the groundwater level begins to exceed the natural variation is generally less than a few hundred meters. It is important to recall that the edges of a pit out to this distance is usually disturbed as there are requirements for storing of overburden material, haul routes and other operational mining activities.

The extent of the drawdown from a pit is controlled by the topography, geologic structure and the lithology.

Groundwater levels in the aquifer return to pre-disturbance levels within approximately one year after pit dewatering activities have ceased.

## **6.0 SURFACE WATER**

The change in groundwater levels over time in the mineral soil and strata beneath the peatlands and wetlands in the area outside of the mine disturbance footprint and within several hundred metres of the operating pit has the potential to be significant in Robb Trend. Observations at the Mercoal wetland have shown that this drawdown does not affect water levels in the overlying organic soils of these wetlands. CVRI expects that the drawdowns within these organic soils will be low –on the order of magnitude of natural variations. CVRI further expects that the drawdowns will be of long duration (effects occurring after development and during operation of facility) but will dissipate quickly after dewatering of the adjacent pit ceases.

### **6.1 Surface Water Chemistry**

Surface water found in wetlands and creeks are a combination of precipitation generally in the form of rainfall events or snow melt and groundwater. The use of a geochemical plot such as a Piper Diagram shows the geochemical signature of the various groundwater samples. This is due to the process by which as groundwater moves through various lithology, the water dissolves the material. The concentrations and ratios of the various inorganic constituents is reflective of the lithology in which the water resides.

Piper diagrams can also aid in determining the chemical reactions taking place in the ground water as the water moves down gradient. A Piper diagram is a three-part diagram consisting of two three-component diagrams for anions and cations, and a diamond-shaped field between them used to

combine and replot the gypsum diagram anion and cation ratios. Geochemical data are plotted as the percent of the major constituents. Changes in the chemical make-up of the groundwater can be seen in the diagram due to the changes in relative concentrations of constituents.

CVRI has extensively monitored surface water throughout the area. [Figure 16](#) shows the sampling locations. Shown in [Figure 17](#) is a Piper diagram which graphically demonstrates that the surface water chemistry is essentially similar throughout the region. Since the water chemistry is similar throughout the area, it is possible to infer that the bulk of surface water encounters similar geologic material which is the glacial tills and overburden of the Quaternary groundwater regime.

## 6.2 Surface Water Quantity

Water courses in the project areas receive groundwater from shallow flow systems. To a greater or lesser extent, groundwater contributes flow to these courses throughout the year. At higher elevations in the basin of the water courses it is possible that the water table will fall below the stream bed in fall or winter and groundwater would then cease to contribute to flow until spring. At lower elevations there is a higher probability that groundwater contributions may continue year round. At these lower elevations, the proportion of groundwater in total flow would be relatively small in spring and summer and higher in fall and winter.

When mine pits are adjacent to water courses, dewatering of the pit may create a hydraulic gradient which could create a surface water loss as water moves from the surface body towards the pit. This condition will be relatively more important in times of low flow such as fall and winter then at times when there is abundant precipitation to generate surface runoff. Such a drainage phenomenon might be anticipated when pits are within 100 m of a water course.

It has been stated that water diverted from a pit through dewatering operations will be clarified and returned to the local drainage system. The act of returning the water to the drainage course will result in an insignificant change in the volume of flow in the water course.

## 6.3 South Extension Wetlands Monitoring

The anticipation of drawdown of groundwater levels impacting nearby peat lands and wetlands (and, potentially water courses) led to the installation of a monitoring system specifically at the South Extension Wetland ([Figure 6](#)).

The South Extension Wetland is a patterned open fen with no internal lawns. Patterned fens are characterized by an interlocking pattern of large open, wet hollows or pools of water (flanks) and drier wooded strings and margins (Halsey and Vitt 1996). The strings are oriented perpendicular to the water flow, forming sinuous ribs within the gently sloping terrain (Halsey and Vitt 1996). The

flanks are often dominated by graminoid species (sedges and wetland grasses) and mosses. The drier wooded strings are dominated by white spruce, shrubs, forbs, grasses and feather mosses.

Ground cover within patterned fens can be quite diverse, depending on whether the fen is poor, moderate-rich, or extreme-rich. The South Extension Wetland is primarily a poor fen dominated by Sphagnum species within the flanks.

In 2013, MEMS conducted a detailed assessment of the effects of pit dewatering on water levels in and beneath the South Extension Wetlands. These effects are assessed over the period of April 2006 through November, 2012 (MEMS, 2013).

Figure 18 presents the water levels and cross section of the wetland. Note that in the water level chart, the shallow monitoring wells showed no significant response (*i.e.*, greater than what would be normal fluctuations) during the dewatering period while the deeper piezometers do show the effects of dewatering.

Geological conditions in the area are important to the formation and preservation of the wetland. At the time of formation of the wetland, the presence of clay or clay till deposits of presumably low hydraulic conductivity in the depression under the wetlands resulted in moist conditions that favored vegetative growth and inhibited decay due to the presence of standing water. Currently, these same conditions buffer the wetland against the temporary effects of drawdown of hydraulic head in the underlying mineral soils caused by mining operations.

The water level information collected at the wetlands conclusively shows that there is downward flow of groundwater out of the wetland under non-mining conditions. This is indicated by downward hydraulic gradients from the wells completed in peat (MERWL 01, 03, 04, 07a) and those completed significantly greater depth (MERWL 08, 09, 10, 11). Due to the presence of clay under the wetland and the presumed low hydraulic conductivity of that clay, the amount of downward flow of groundwater out of the wetland was low.

Adjacent mine pits resulted in drawdown of water levels in the bedrock that extended beneath the wetland, this occurred at MERWL 09 and 10. These drawdowns occurred at depths of 46 and 89 m respectively in the bedrock – they do not reflect conditions in water table in the overlying peat. This drawdown even extended, to some degree, to the glacial deposits below the wetlands. This may have occurred prior to the period of record in MERWL 12, 14, 15 and 16. This occurred at MERWL 09 but not at MERWL 11. This phenomenon is therefore not ubiquitous throughout the wetland.

In spite of this drawdown in the mineral deposits below the wetland, the water table in the peat of the Wetlands was not lowered regardless of proximity to the mine pit. This is shown in MERWL 01, 03,

04, 05 and 07b. The water table in the peat remained approximately at the surface and virtually unchanged throughout the period of 2006 through 2012.

Thus, although the natural downward hydraulic gradient was increased by mining activities, the downward flow of water from the wetland did not increase sufficiently to cause any measureable change in the water table within the peat deposits.

This information demonstrates that a drawdown of hydraulic head of as much as 40 m produced no demonstrable impact on the wetland. This lack of impact occurred despite the fact that pits were present on two ends of the 1,500 metre-long wetland and that the lowering of the water level in the pits has been present since 2006.

This study also supports the concept of two distinct groundwater regimes and that there is only minor interaction between the two systems.

## 7.0 CONCLUSIONS

The existing Coal Valley Mine and the proposed Robb Trend Project are geographic adjacent and as such exhibit similar terrain, geology and climate. These factors control the hydrogeological environments and in turn the groundwater regimes.

This document has shown that sufficient similarity exists between CVM and the Project hydrogeological environment that similar groundwater regimes will be found.

Geology is an important attribute in determining the hydrogeological environment. This document shows that the stratigraphy and lithology of the two areas are well known and documented.

Surficially, the entire area is overlain by thin Quaternary deposits. These deposits tend to be thicker in lower lying areas and thinner in upland areas. A shallow groundwater regime is formed within these deposits. This regime is primarily controlled by topography and climate.

Within the bedrock groundwater regime, there are three major formations and that they are the same across the three trends. Underlying these glacial tills, are from youngest to oldest:

- Paskapoo Formation;
- Coalspur Formation containing the minable coal; and
- Brazeau Formation.

This stratigraphy has been subjected tectonic forces forming a synclinal structure and then subject to erosion prior to the deposition of the glacial overburden.

Comparison of hydrogeological data such as hydraulic conductivity and water levels have shown that the two areas to be similar in nature. The average hydraulic conductivity values for over 100 monitoring wells in the CVM and Robb Trend Project area are similar at 2.9E-6 and 4.0E-6 m/s respectively. Values from other studies conducted in the area also show similar values.

Water levels measured in the undisturbed Robb Trend Project area show natural fluctuations of a few meters similar to what has been observed at CVM.

Groundwater flow direction for area is controlled by topography and geologic structure. For the shallow groundwater regime, flow is topographically controlled while in the deeper groundwater regime, geologic structure the primary factor. Flow in the deeper groundwater regime is generally southeast.

A number of examples were given between the two existing mining trends and that of Robb Trend that show the impact to groundwater flow and quantity is well known and predictable. These examples include groundwater dewatering from operating pits to pumping tests.

Dewatering of pits showed that drawdown in the area did not generally extend greater than a few hundred meters from the edge of a pit and that water levels returned to pre-disturbance conditions in less than a year.

A study of impacts to wetlands due to pit dewatering in the Mercoal area distinctly shows the two groundwater regimes (surficial/shallow and regional/ bedrock). While dewatering causes impact to the bedrock groundwater regime, the near surface regime was not affected at all. Since surface water features such as rivers, creeks and ponds primarily interact with the shallow groundwater regime, there are no significant impacts to these features caused by dewatering of nearby pits.

The understanding of the hydrogeologic environment and information will allow CVRI to validly apply the empirical method of impact prediction. Monitoring results in the existing trends are extendable to assessment of impacts in the proposed project area.

A further positive consideration with respect to the application of the empirical model is that the monitoring of the existing two trends has been subject of approval condition such as system design and annual reporting.

This information sets a context from the review of the hydrogeological impact assessment of the Robb Trend Project– namely that similar situations have not produced adverse impacts.

It is the profession opinion of Millennium EMS Solutions Ltd. (APEGA Permit No. 07002) that the hydrogeologic environment and the resultant groundwater regimes in the Coal Valley Mine and the proposed Robb Trend Project mine are similar to such an extent that the experiences and knowledge of the groundwater conditions in the CVM will transcend to Robb Trend successfully.



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## AUTHENTICATION

The Engineering, Geological and Geophysical Professions Act (the Act) of Alberta requires that engineering, geological or geophysical work be authenticated by the application of:

- The professional seal or stamp of the individual member responsible for preparing the work **and**
- The corporate permit number or stamp of the company employing the responsible individual member.

This section identifies those portions of this report that fall under the Act and will be authenticated in compliance with the Act.

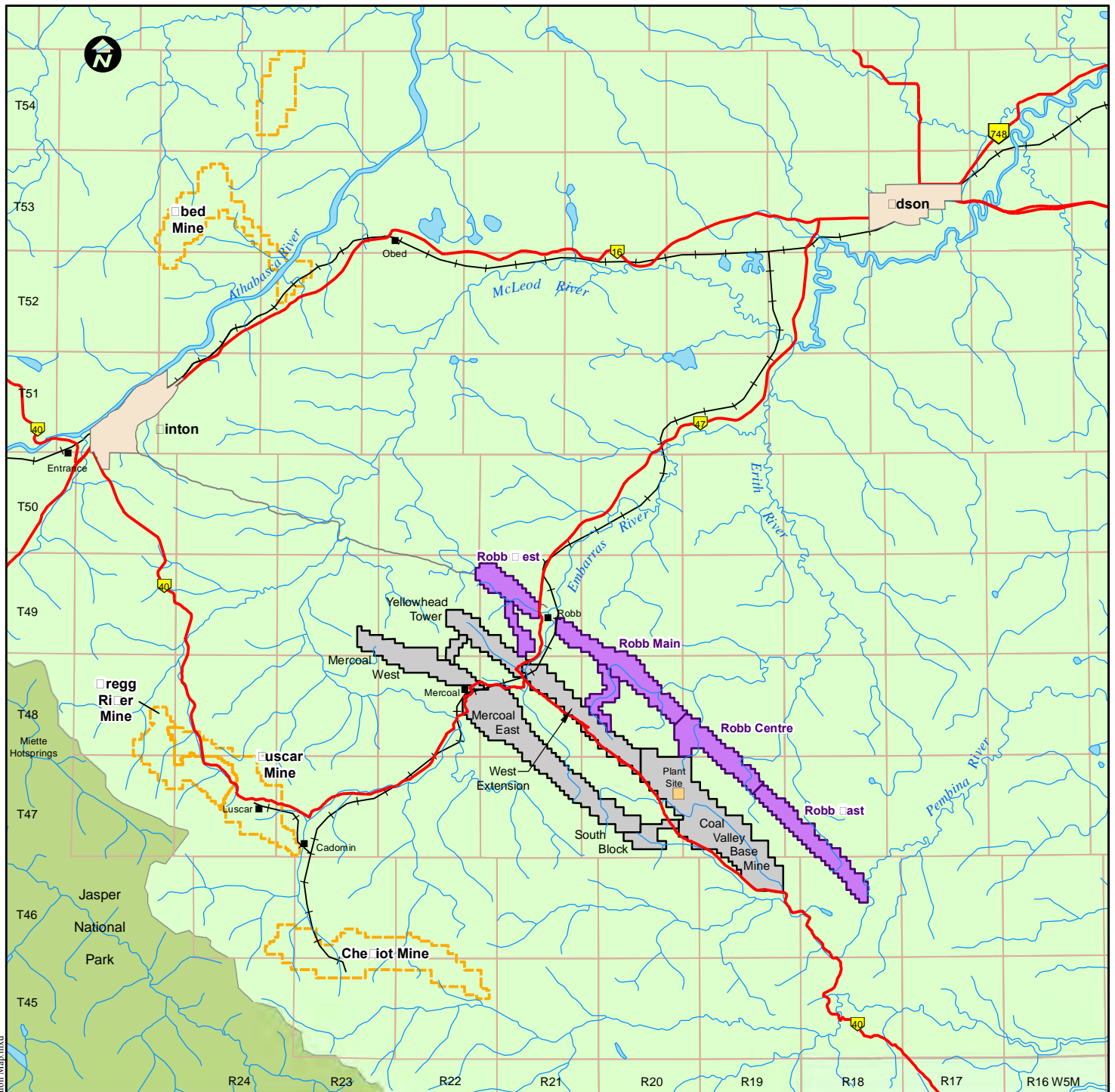
The report entitled “ *Robb Trend and Coal Valley Mine: A Comparative Review*” meet the definition of engineering or geology within the Act and is authenticated with APEGA Permit to Practice Number P07002 and the professional stamp applied below:



Millennium EMS Solutions Ltd. provides the same level of quality assurance to our clients throughout this report.

## **APPENDIX A: FIGURES**

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Document Path: K:\Active Client\CVRI\Final Docs\08-041B\Comparative Study\Fig. 1 Project Location Map.mxd

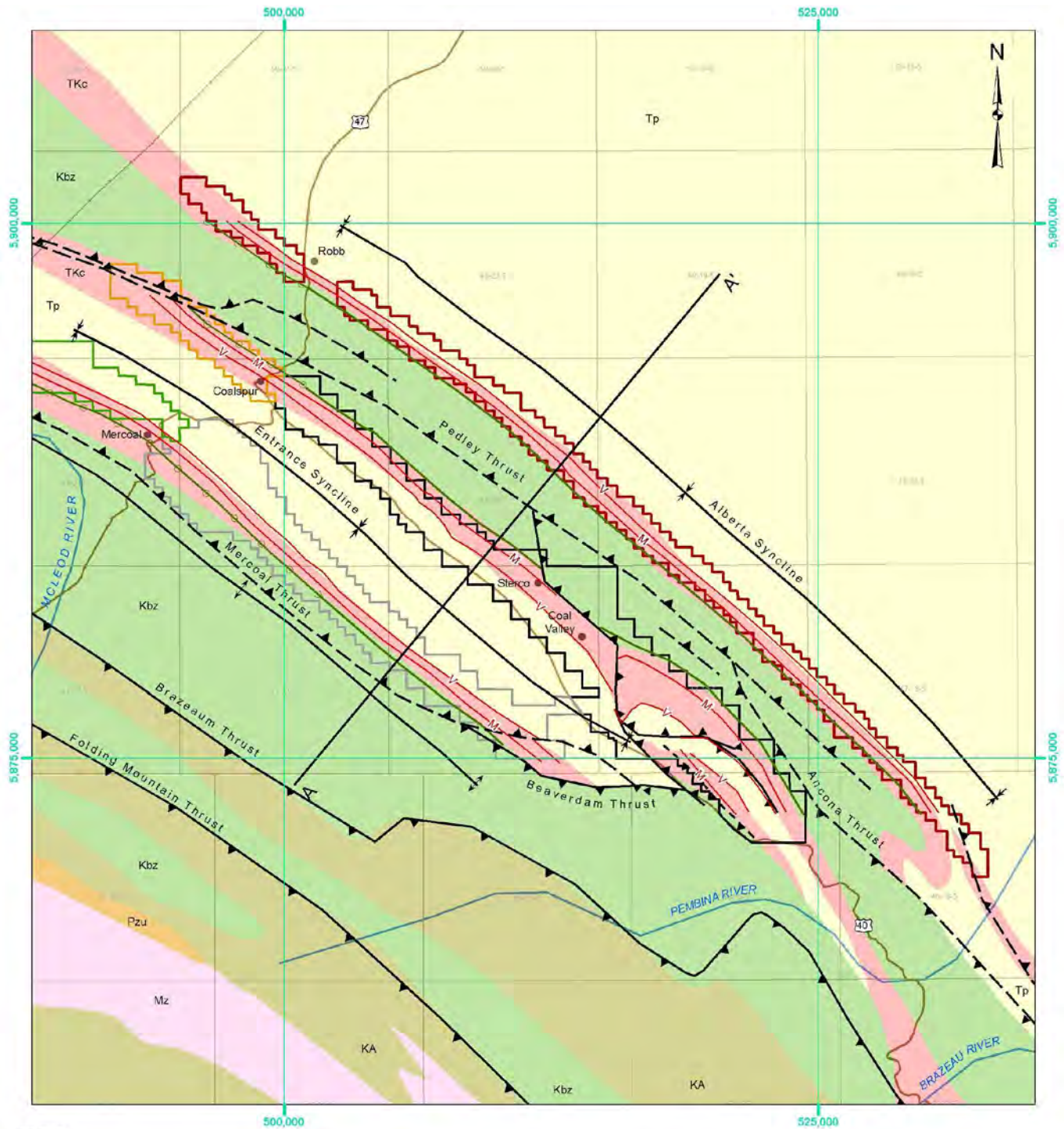


**Legend**

- Proposed Robb Trend Mine Permit Boundary
- Existing Coal Valley Mine Permit Areas
- Other Mines



PROJECT: <h2 style="margin: 0;">Coal Valley Mine Robb Trend SIR - Comparative Study</h2>									
TITLE: <h3 style="margin: 0;">Project Location Map</h3>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">DRAWN: PS/JG</td> <td style="width: 50%;">FIGURE:</td> </tr> <tr> <td>CHECKED: EG</td> <td style="text-align: center;">□</td> </tr> <tr> <td>DATE: Jun 13/13</td> <td></td> </tr> <tr> <td>PROJECT: 08-041B</td> <td></td> </tr> </table>	DRAWN: PS/JG	FIGURE:	CHECKED: EG	□	DATE: Jun 13/13		PROJECT: 08-041B	
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DATE: Jun 13/13									
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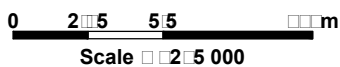


**LEGEND**

- ⊕ SYNCLINE
- ⊕ ANTICLINE
- M MYNHEER COAL SEAM
- V VAL D'OR COAL SEAM
- ⊖ ENTRANCE CONGLOMERATE
- THICK SANDSTONE AT STRATIGRAPHIC LEVEL OF ENTRANCE CONGLOMERATE
- YELLOWHEAD COAL MINE
- MERCOCAL WEST COAL MINE
- ROBB TREND PROJECT AREA
- COAL VALLEY MINE
- MERCOCAL EAST
- Tp (PASKAPOO FORMATION)
- Tkc (COALSPUR FORMATION)
- Kbz (BRAZEAU FORMATION)
- KA (ALBERTA GROUP)
- Mz (LOWER MESOZOIC - LOWER CRETACEOUS)
- Pzu (UPPER PALEOZOIC)
- Pz (LOWER PALEOZOIC)

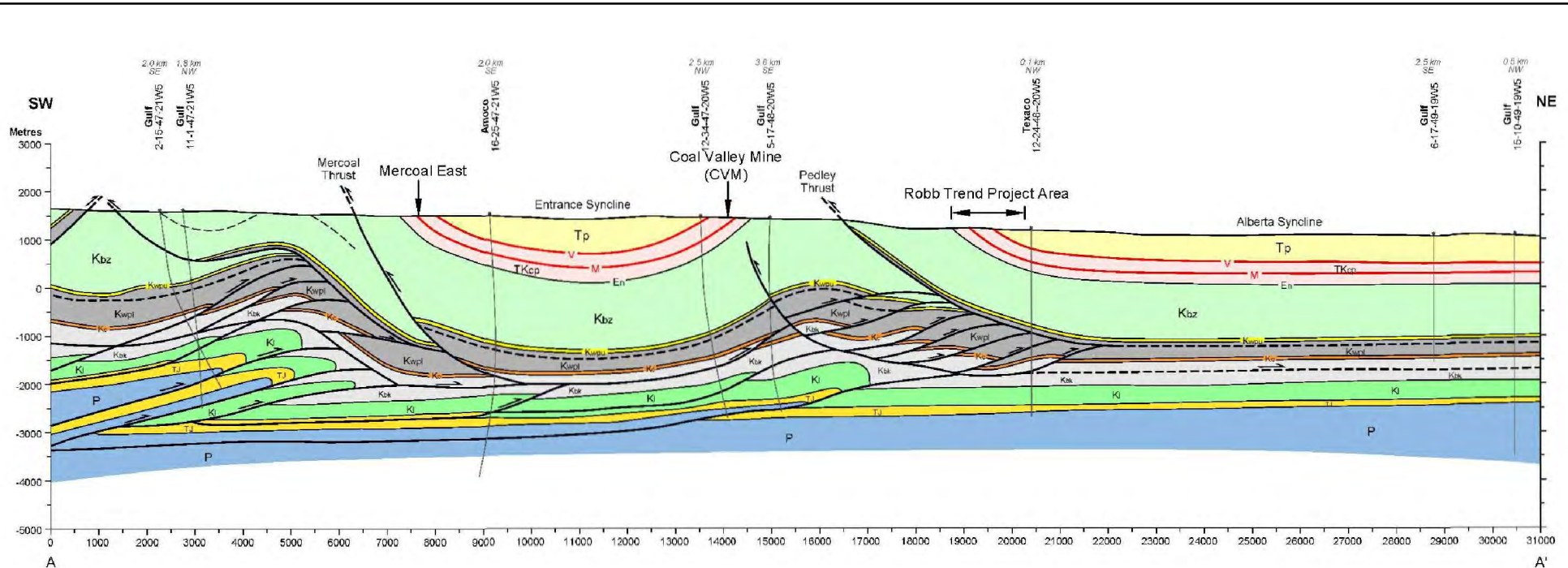
**NOTES:**

1. COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N.
2. ALBERTA GEOLOGY OBTAINED FROM ALBERTA GEOLOGICAL SURVEY 1:50,000 MAP SET, FEATURE LIMITS ARE APPROXIMATE.
3. TOWNSHIPS ARE LABELLED AS: TOWNSHIP-RANGE-MERIDIAN.
4. GEOLOGICAL FEATURES MAY EXTEND FURTHER THAN SHOWN.

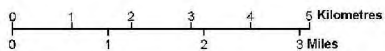


REF: MDH Engineering Solutions, Figure 2.1, March 2012.

PROJECT: <b>Coal Valley Mine          Robb Trend SIR - Comparative Study</b>	
TITLE: <b>Project Regional Geology</b>	...08-041b/Comp Study/Fig 2 Bedrock Geology.dwg DRAWN: JDC/JG CHECKED: EG DATE: Jun 13/13 PROJECT: 08-041B
	FIGURE: <b>2</b>



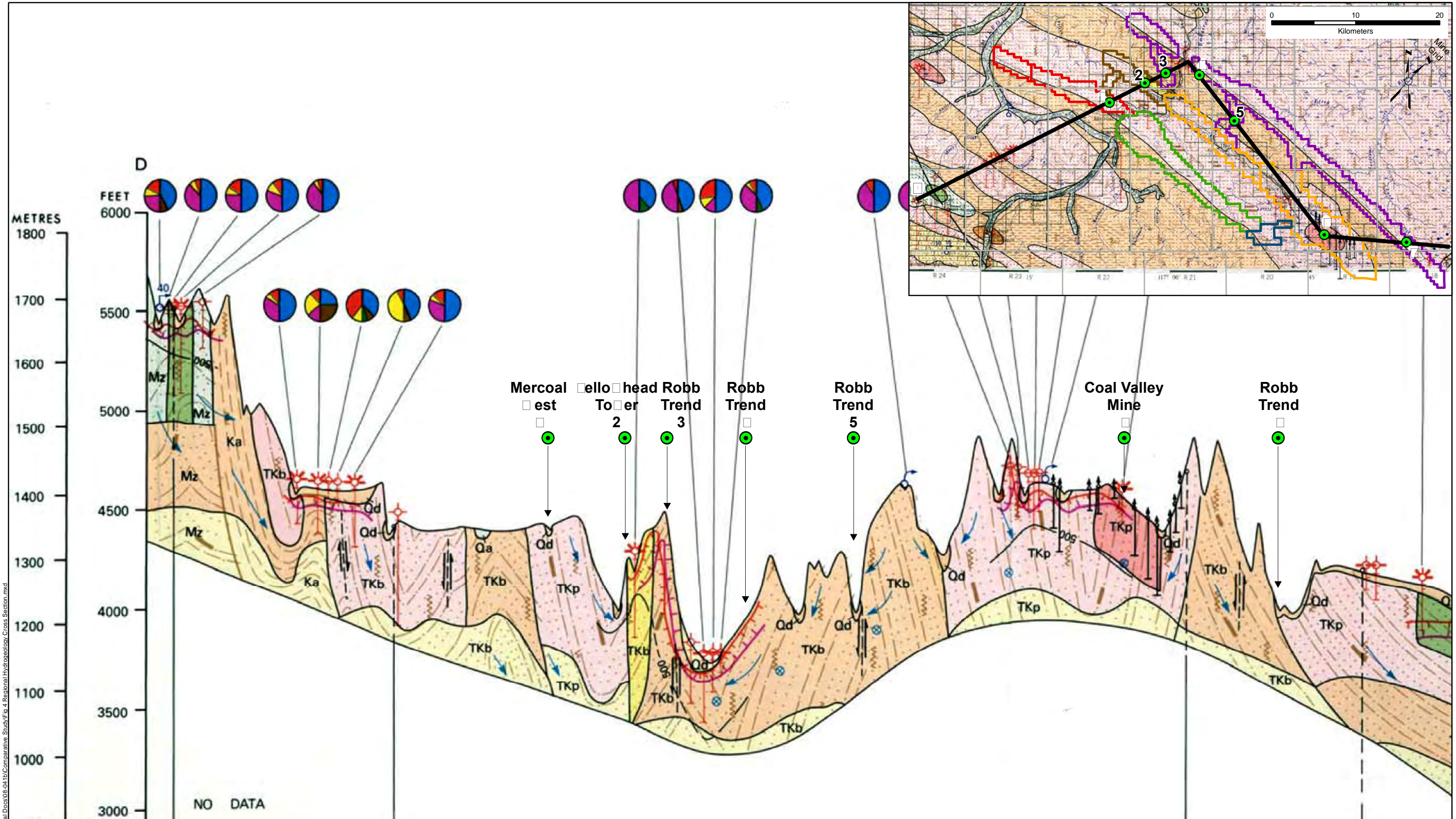
- |                                 |                                     |   |
|---------------------------------|-------------------------------------|---|
| <b>TERTIARY</b>                 | <b>CRETACEOUS</b>                   | <b>TRIASSIC, JURASSIC AND CRETACEOUS</b>                            |
| <b>TP</b> Paskapoo Formation    | <b>Kbz</b> Brazeau Formation        | <b>TJ</b> Spray River Group, Fernie Formation, Nikanassin Formation |
| <b>Tercp</b> Coalspur Formation | <b>Kwpu</b> Upper Wapiabi Formation | <b>P</b> Paleozoic Rocks  |
| <b>V</b> Val d'Or coal seam     | <b>Kwpl</b> Lower Wapiabi Formation | Fault with sense of movement (defined, approximate)                 |
| <b>M</b> Mynheer coal seam      | <b>Kc</b> Cardium Formation         | Gas well and distance of well projection                            |
| <b>En</b> Entrance conglomerate | <b>Kbk</b> Blackstone Formation     |   |
|                                 | <b>Kl</b> Luscar Group              |   |



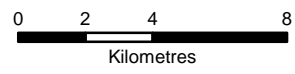
NOTE: GEOLOGICAL CROSS-SECTION OBTAINED FROM ALBERTA ENERGY AND UTILITIES BOARD / ALBERTA GEOLOGICAL SURVEY.

PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>	
TITLE: <b>Regional Geology Cross-Section</b>	
DRAWN: JDC/JG	FIGURE: <b>3</b>
CHECKED: EG	
DATE: Jun 13/13	
PROJECT: 08-041B	



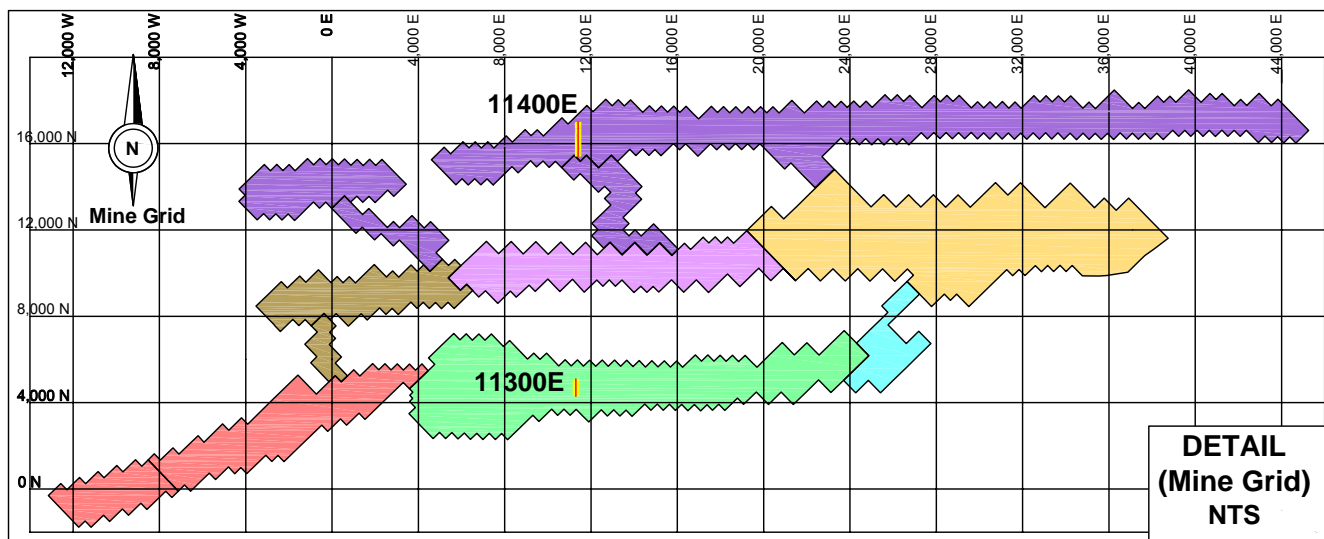
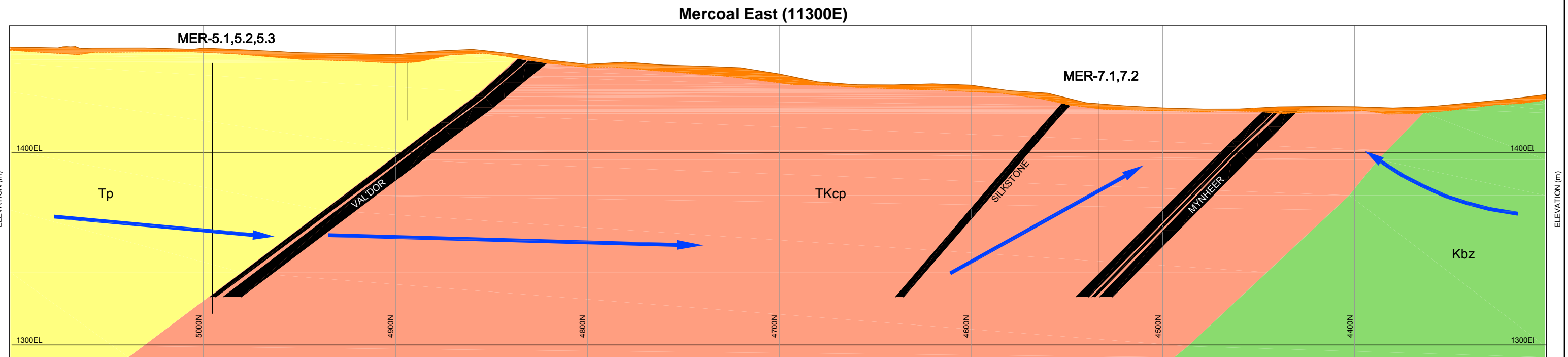
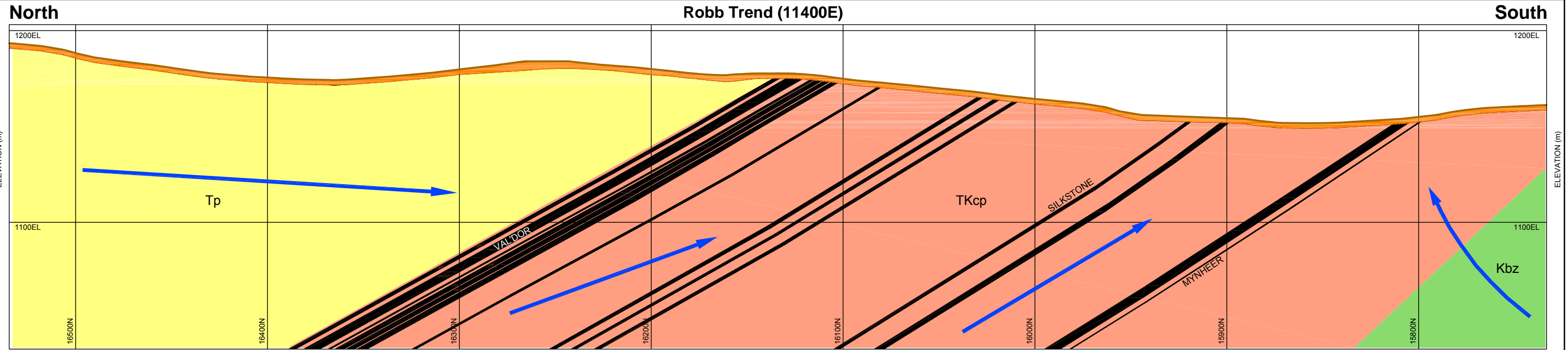


- Legend**
- █ Robb Trend
  - █ Coal Valley Mine
  - █ Yellowhead Tower
  - █ Mercoal East
  - █ Mercoal West
  - █ South Block



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Regional Hydrogeology Cross Section</b>		
DRAWN: JG	CHECKED: EG	FIGURE: □
DATE: Jun 13/13		
PROJECT: 08-041B		


Document Path: K:\Active Client\CVRI\Final Docs\08-041B\Comparative Study\Fig. 4 Regional Hydrogeology Cross Section.mxd

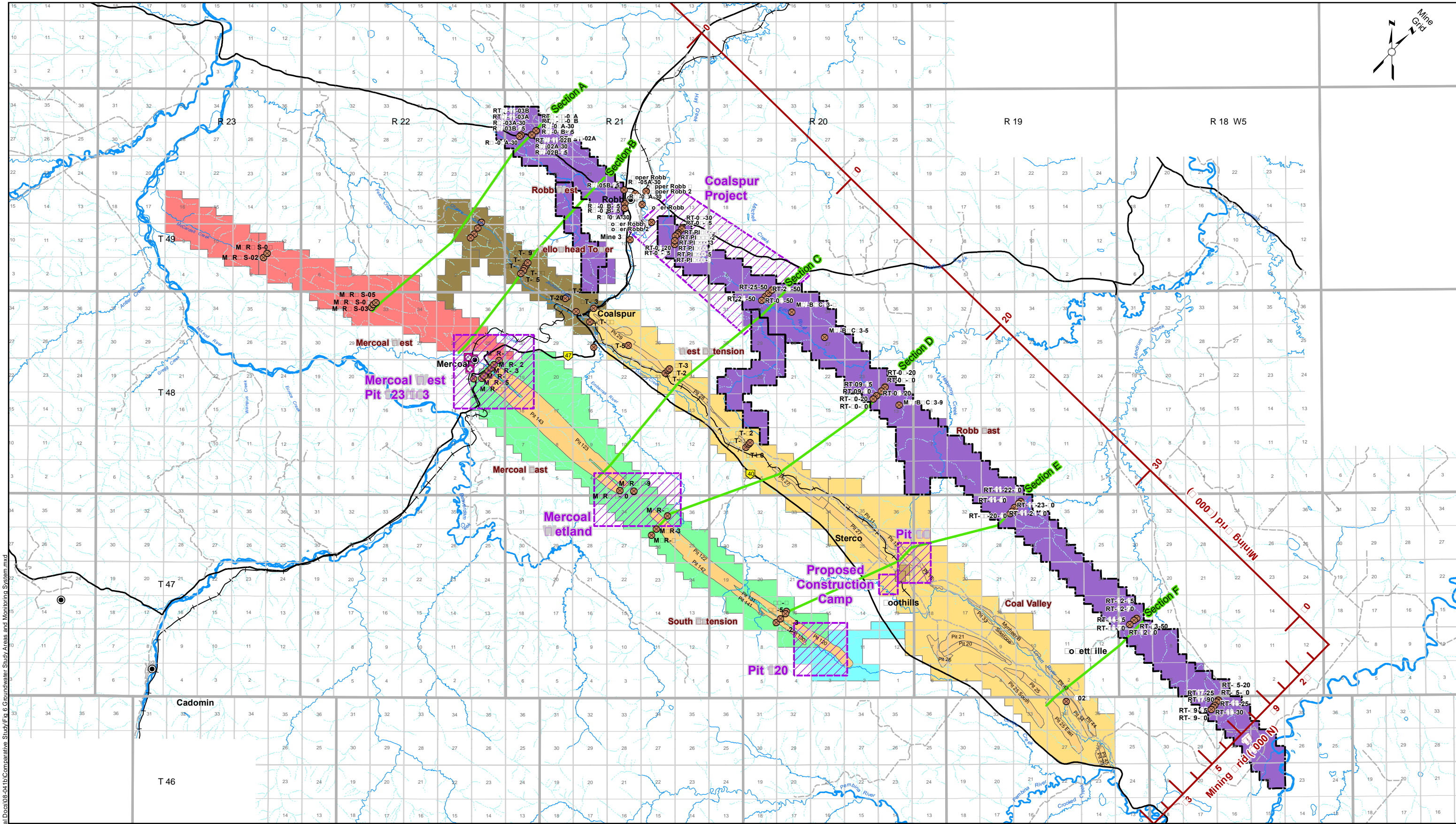


- Legend (Detail)**
- Mine Permit Boundary**
- Coal Valley Base Mine
  - Mercoal East
  - Mercoal West
  - Robb Trend
  - South Block
  - West Extension
  - Yellowhead Tower

- Legend (Cross Section)**
- Formation**
- Tp Paskapoo Formation
  - TKcp Coalspur Formation
  - Kbz Brazeau Formation
- Other Features**
- Coal
  - Till
  - MER-7.1 Piezometer Site
  - Groundwater Flow Direction

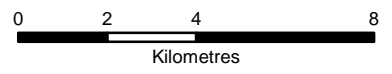
0 20 40 80m  
Scale 1 : 2 000  
No Vertical Exaggeration

<b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
<b>Comparison of Mercoal East and Robb Trend Hydrogeological Cross Section</b>		
PROJECT: DRAWN: JG CHECKED: EG DATE: Jun 13/13 PROJECT: 08-041B	FIGURE: <b>5</b>	Final Docs\08-041B\Comp Study\Hydro_Sections.dwg



Document Path: K:\Active Client\CVRI\Final Docs\08-04-13\Comparative Study\Fig 8 Groundwater Study Areas and Monitoring System.mxd

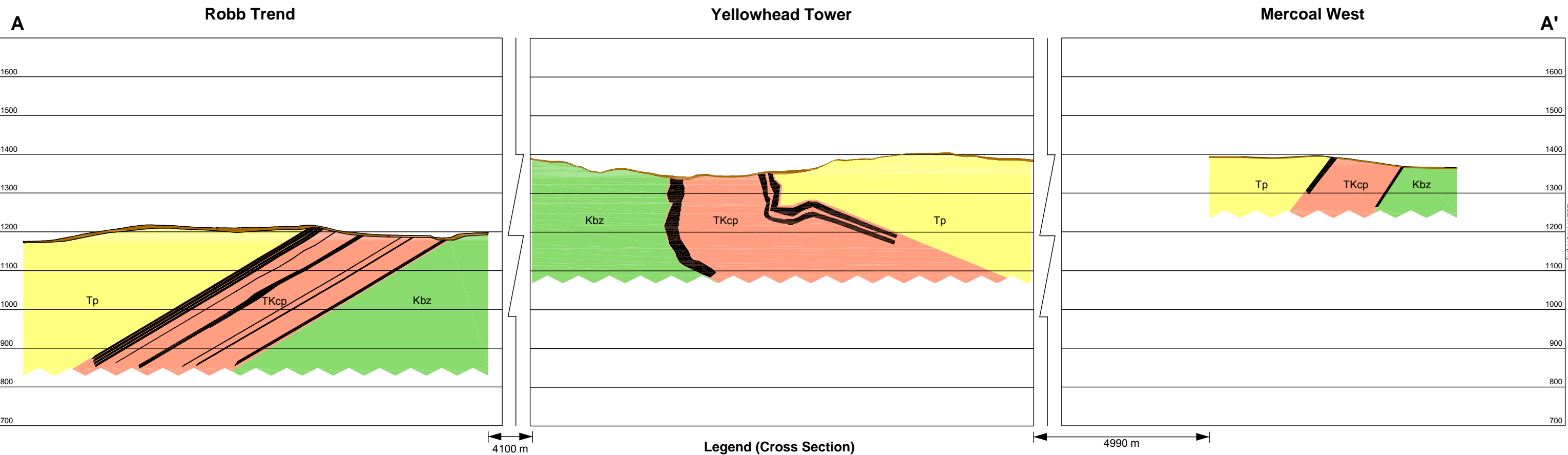
- Legend**
- Existing Monitoring Well
  - Water Well
  - Study Area
  - Robb Trend Mine Permit Boundary (Proposed)
  - Mercoal West Mine Permit Boundary
  - Yellowhead Tower Mine Permit Boundary
  - Existing Coal Valley Mine Permit Boundary
  - Mine Pit
  - Coal Valley Operational Mine Area



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Groundwater Study Areas and Monitoring System</b>		
DRAWN: JDC/JG	FIGURE:	
CHECKED: EG		
DATE: Jun 13/13		
PROJECT: 08-041B		

North

South



**Legend (Cross Section)**

**Formation**

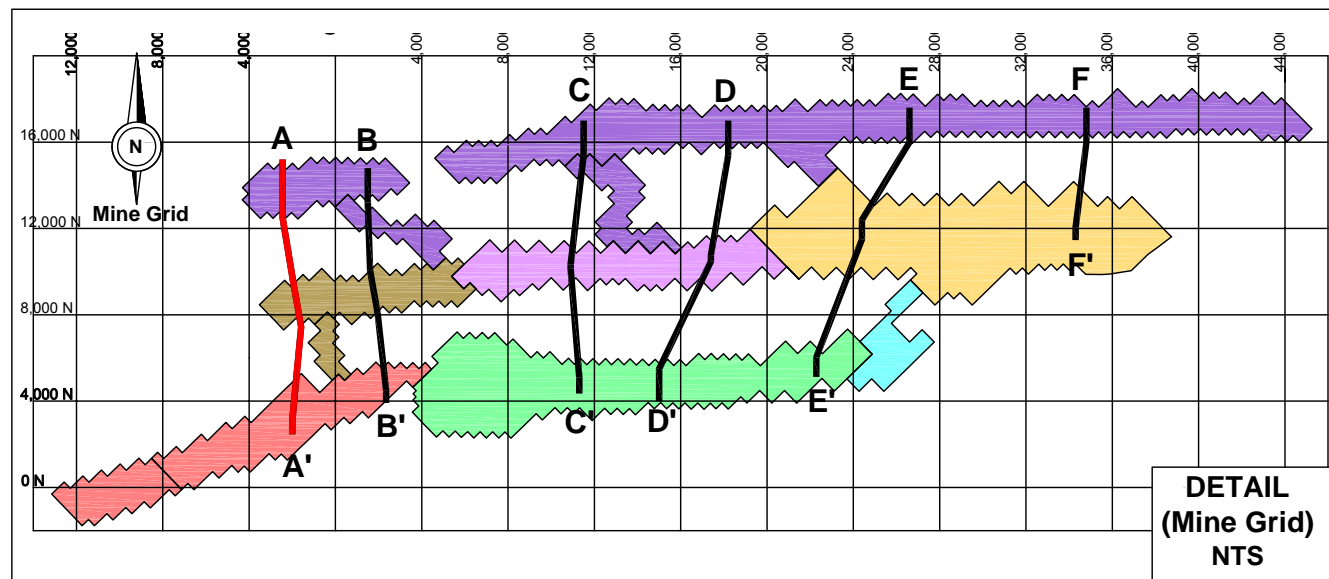
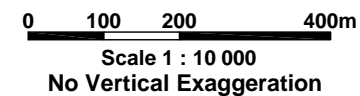
- Tp Paskapoo Formation
- TKcp Coalspur Formation
- Kbz Brazeau Formation

- Coal
- Till

**Legend (Detail)**

**Mine Permit Boundary**

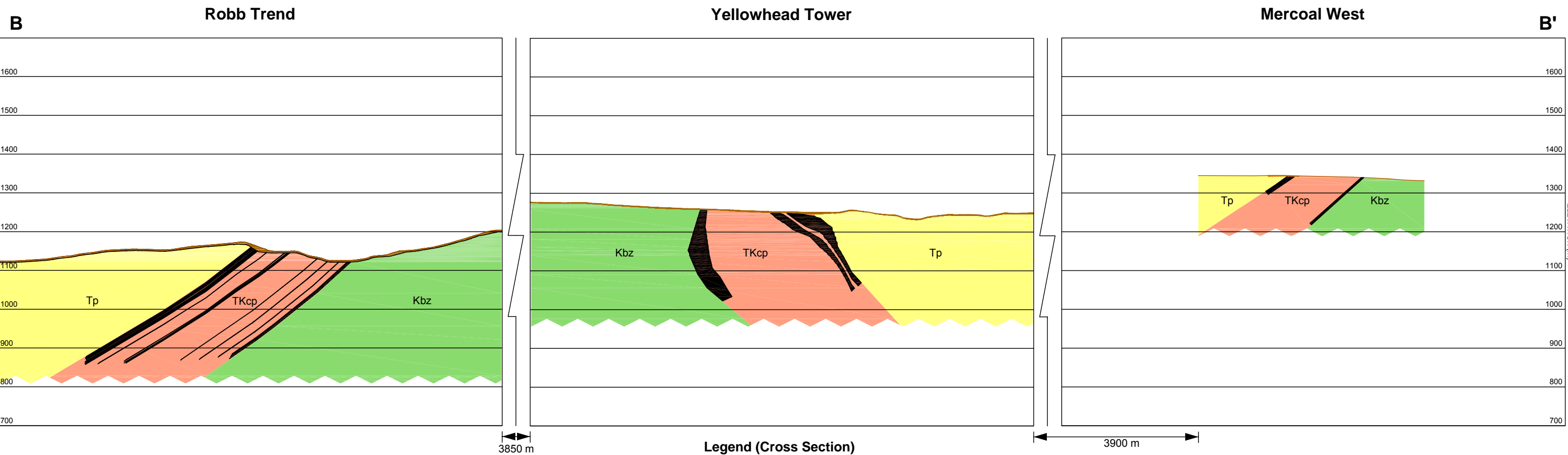
- Coal Valley Base Mine
- Mercoal East
- Mercoal West
- Robb Trend
- South Block
- West Extension
- Yellowhead Tower



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Cross Section Comparison Line A-A'</b>		
DRAWN: JG	CHECKED: EG	FIGURE: <b>7</b>
DATE: Jun 10/13	PROJECT: 08-041B	

North

South

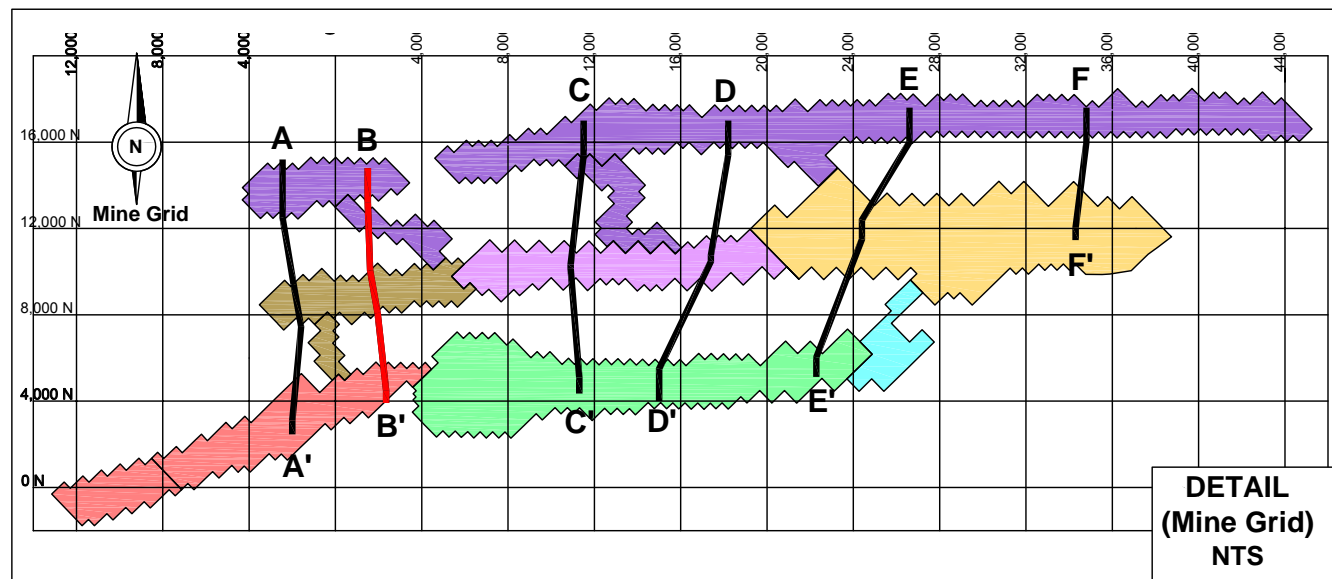
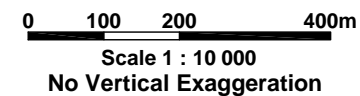


Legend (Cross Section)

- Formation**
- Tp Paskapoo Formation
  - TKcp Coalspur Formation
  - Kbz Brazeau Formation
  - Coal
  - Till

Legend (Detail)

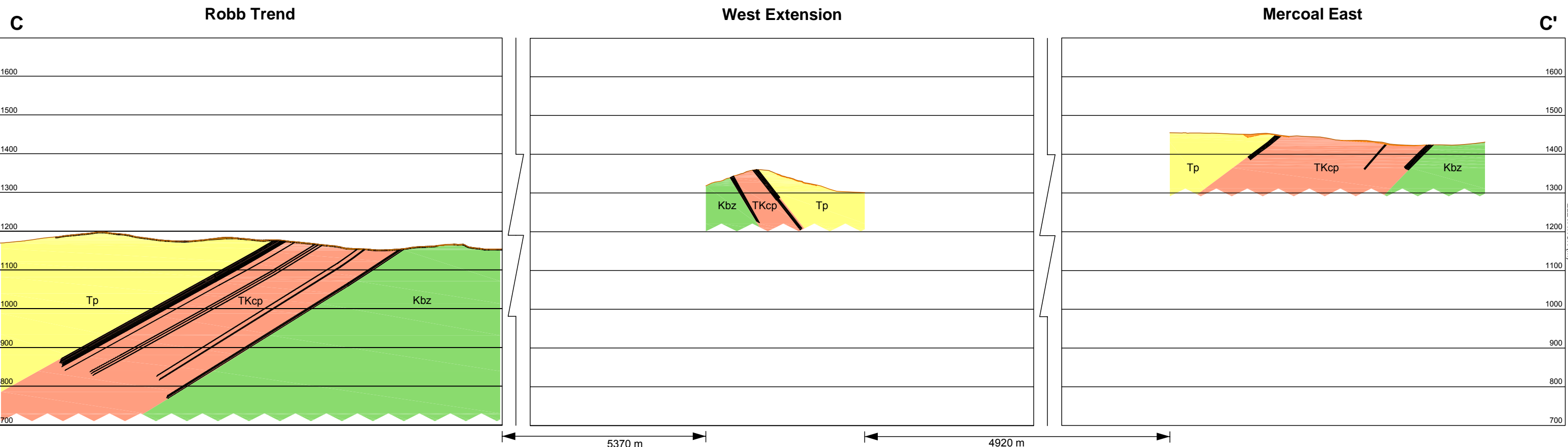
- Mine Permit Boundary**
- Coal Valley Base Mine
  - Mercoal East
  - Mercoal West
  - Robb Trend
  - South Block
  - West Extension
  - Yellowhead Tower



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Cross Section Comparison Line B-B'</b>		
DRAWN: JG	CHECKED: EG	FIGURE: <b>8</b>
DATE: Jun 11/13	PROJECT: 08-041B	

North

South



Legend (Cross Section)

Formation

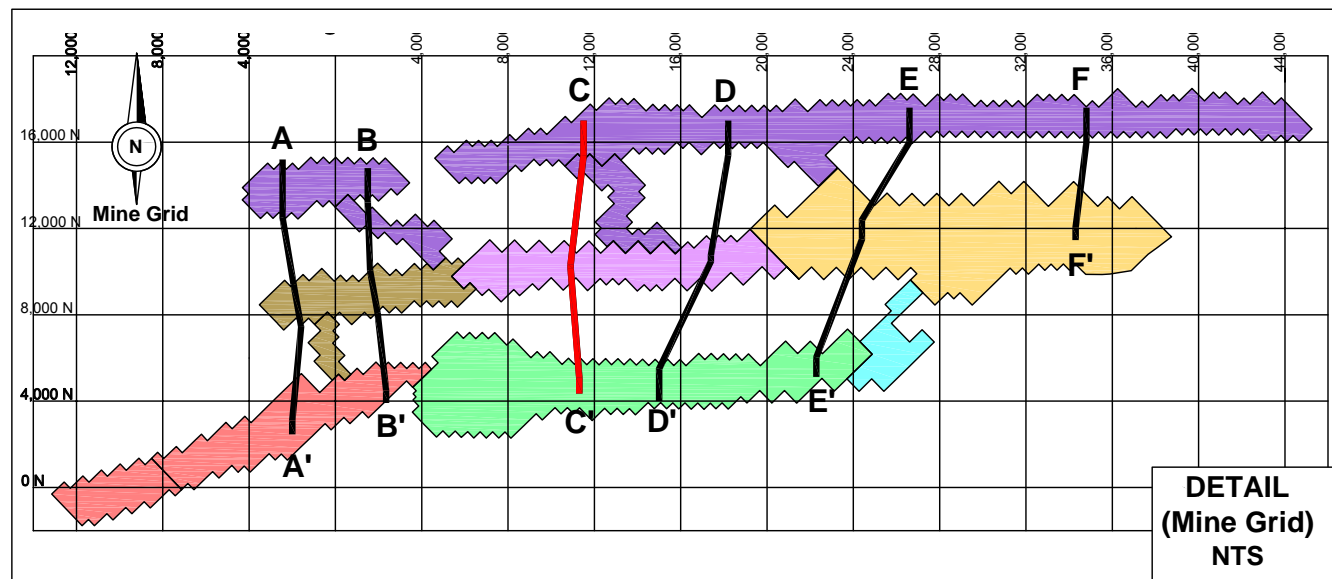
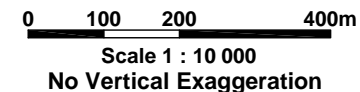
- Tp Paskapoo Formation
- TKcp Coalspur Formation
- Kbz Brazeau Formation

- Coal
- Till

Legend (Detail)

Mine Permit Boundary

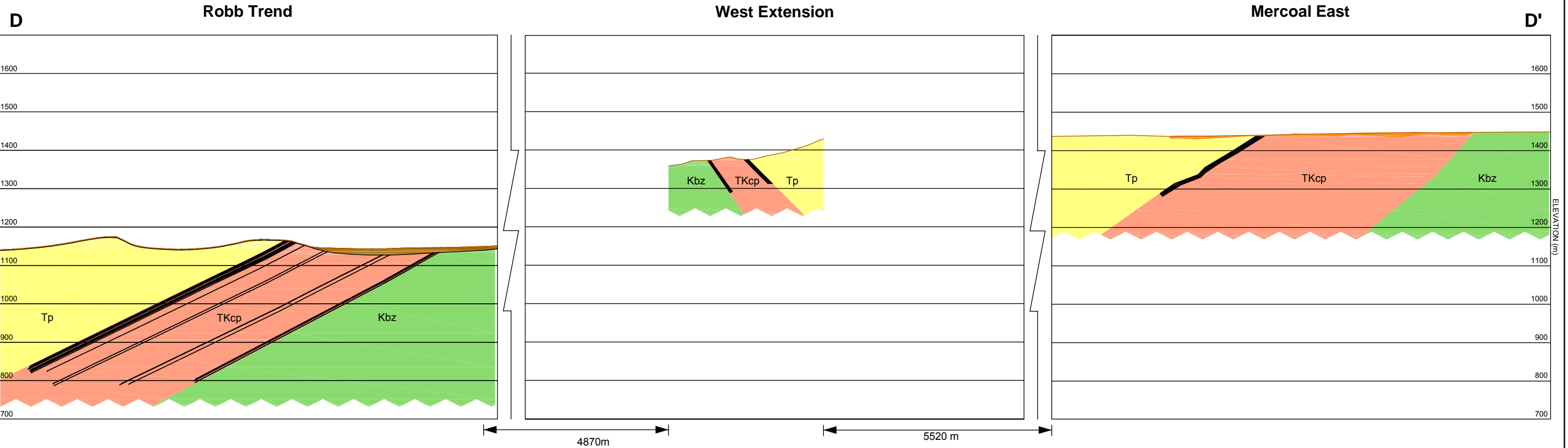
- Coal Valley Base Mine
- Mercoal East
- Mercoal West
- Robb Trend
- South Block
- West Extension
- Yellowhead Tower



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Cross Section Comparison Line C-C'</b>		
DRAWN: JG	CHECKED: EG	FIGURE: <b>9</b>
DATE: Jun 11/13	PROJECT: 08-041B	

North

South



Legend (Cross Section)

Formation

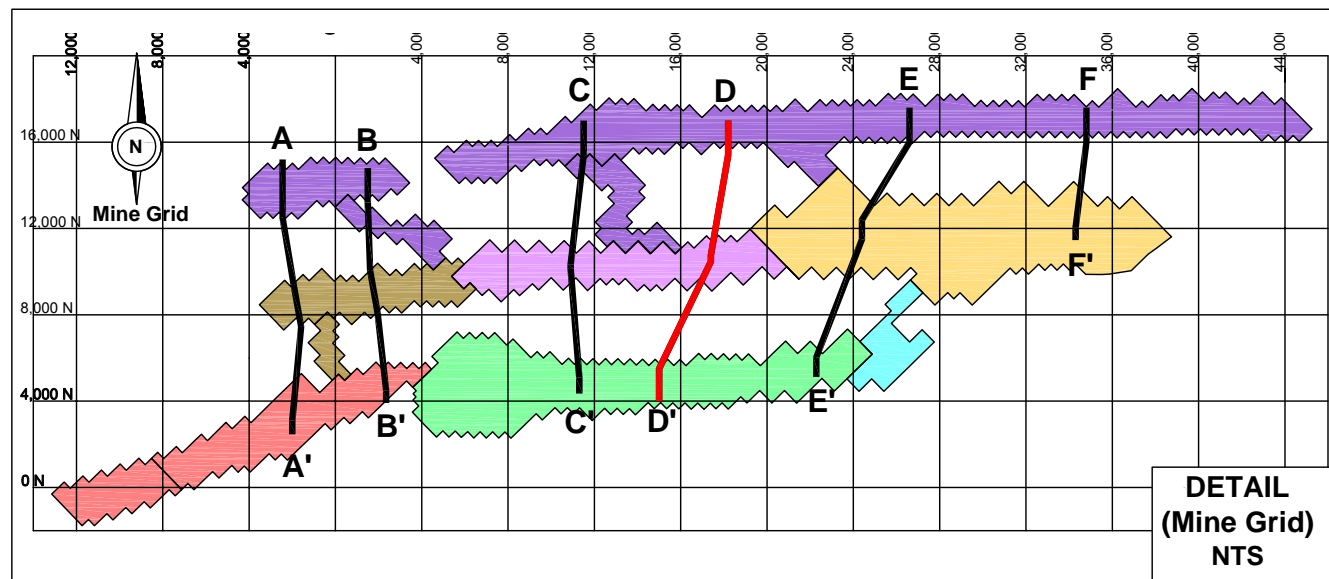
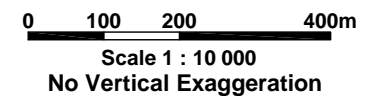
- Tp Paskapoo Formation
- TKcp Coalspur Formation
- Kbz Brazeau Formation

- Coal
- Till

Legend (Detail)

Mine Permit Boundary

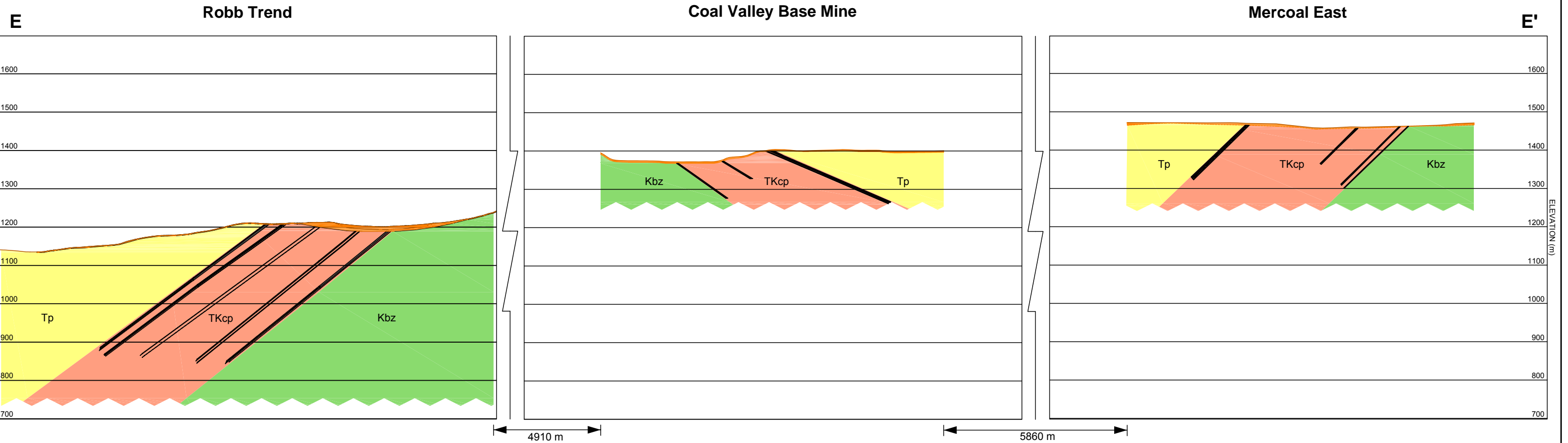
- Coal Valley Base Mine
- Mercoal East
- Mercoal West
- Robb Trend
- South Block
- West Extension
- Yellowhead Tower



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Cross Section Comparison Line D-D'</b>		
DRAWN: JG	CHECKED: EG	FIGURE: <b>10</b>
DATE: Jun 14/13	PROJECT: 08-041B	

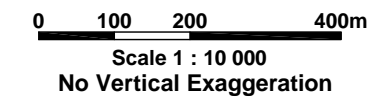
North

South



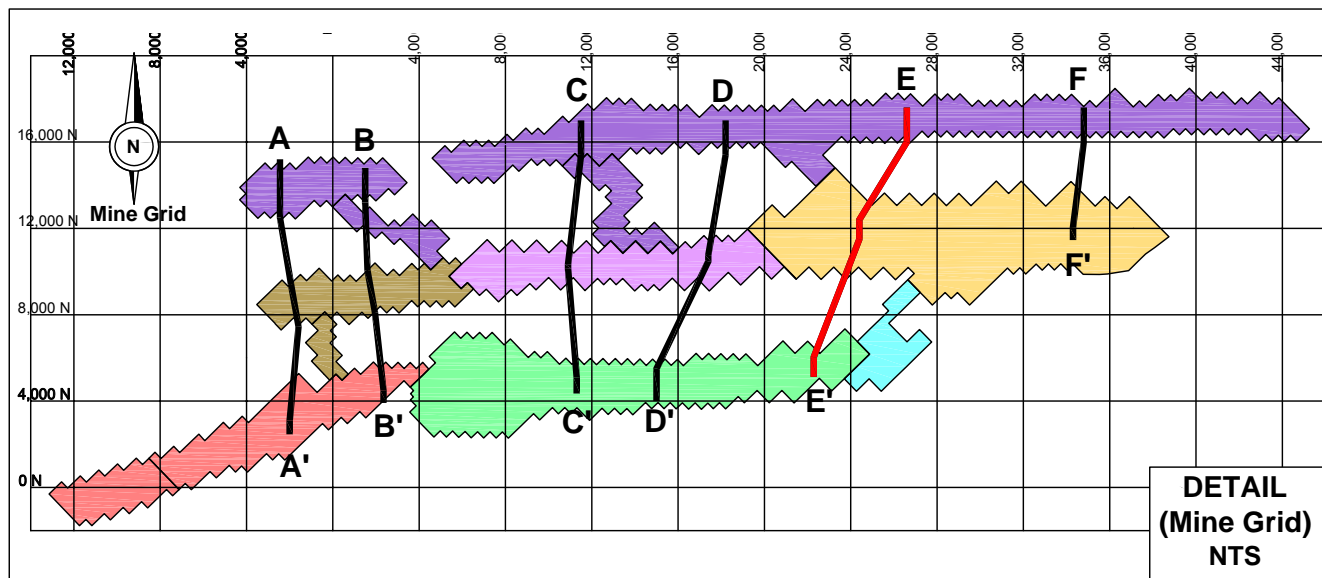
Legend (Cross Section)

- Formation**
- Tp Paskapoo Formation
  - TKcp Coalspur Formation
  - Kbz Brazeau Formation
- Coal**
- Coal
- Till**
- Till



Legend (Detail)

- Mine Permit Boundary**
- Coal Valley Base Mine
  - Mercoal East
  - Mercoal West
  - Robb Trend
  - South Block
  - West Extension
  - Yellowhead Tower

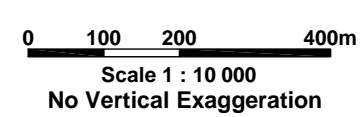
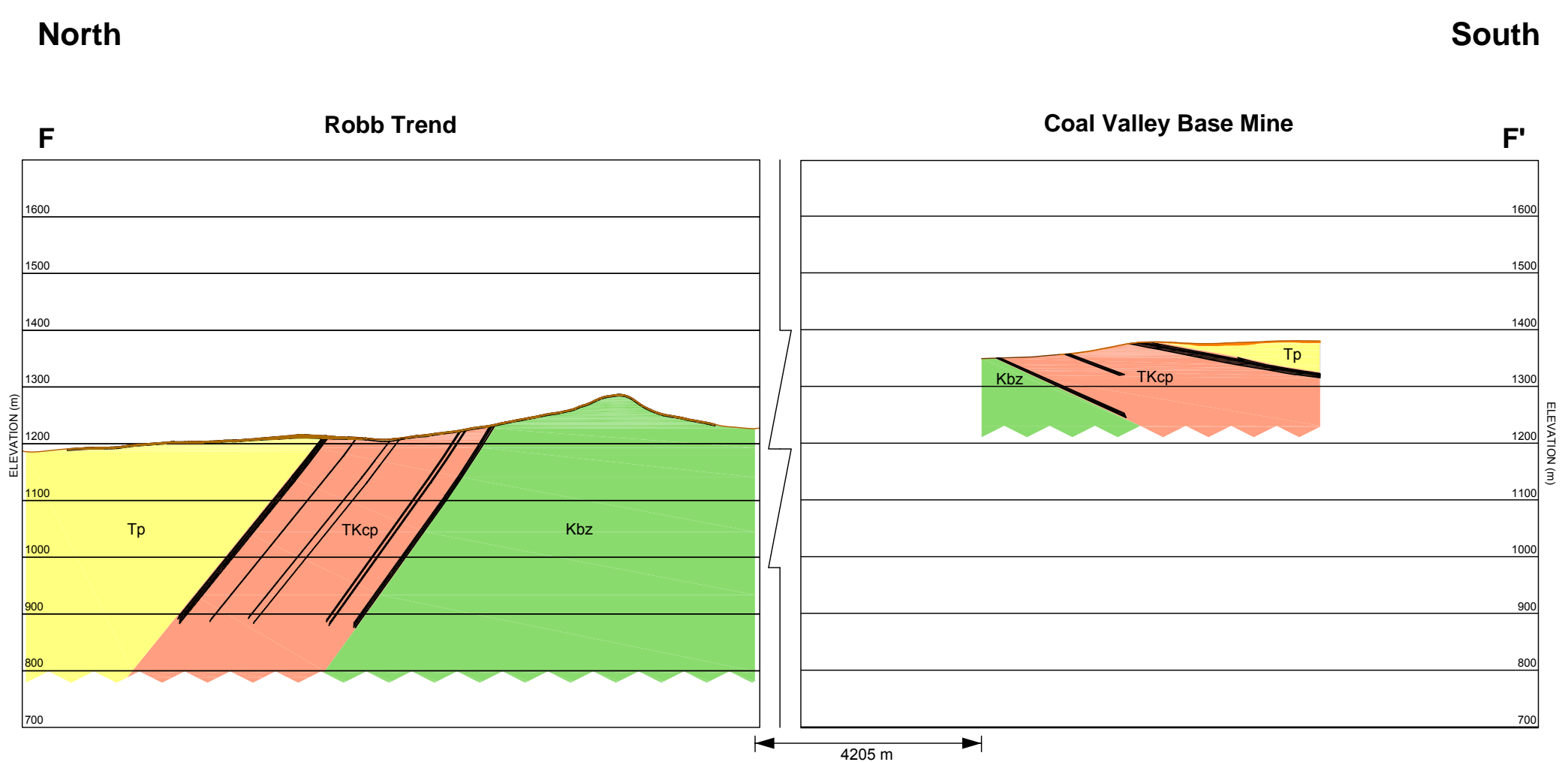


PROJECT:  
**Coal Valley Mine  
Robb Trend SIR - Comparative Study**

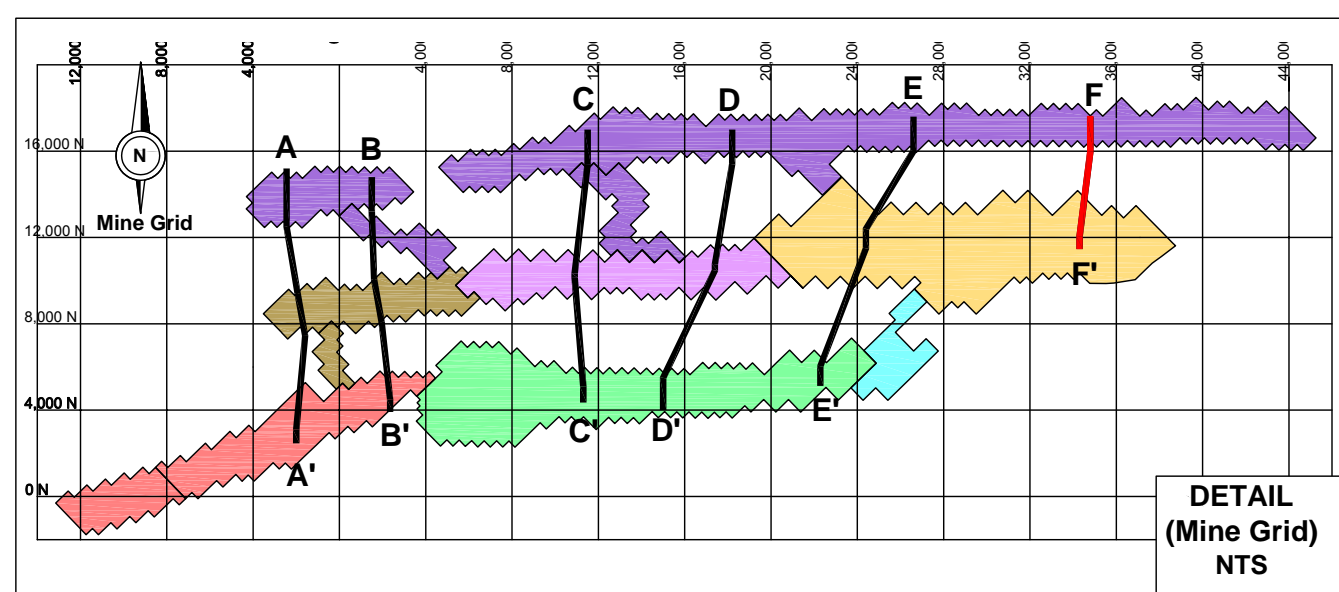
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...Final Docs\08-041b\Comp Study\Section Lines.dwg	
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DATE: Jun 13/13	
PROJECT: 08-041B	






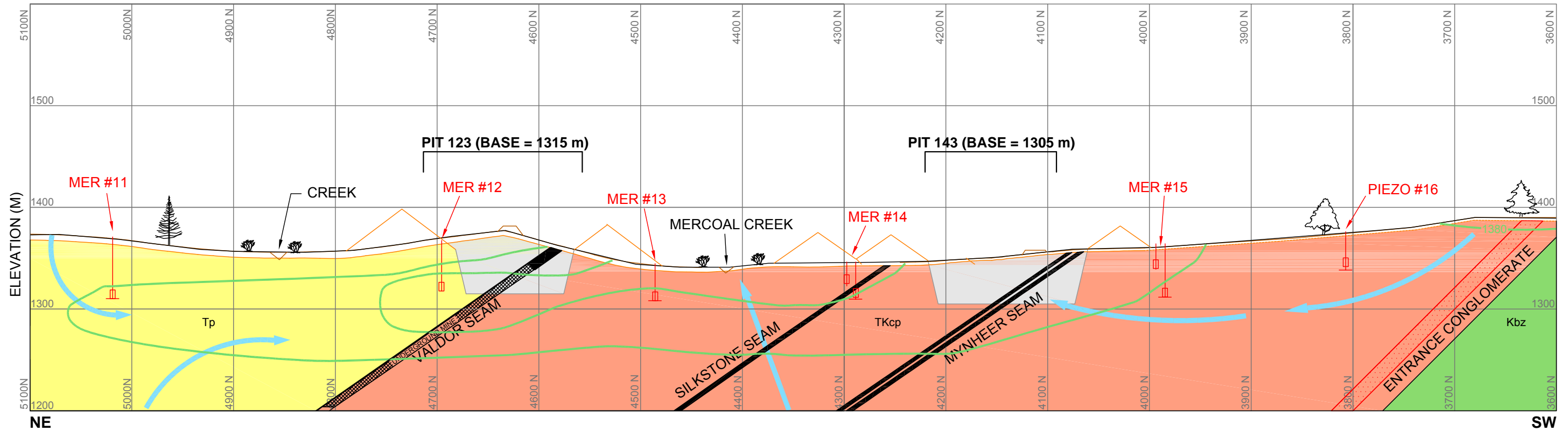
- Legend (Cross Section)**
- Formation**
- Tp Paskapoo Formation
  - TKcp Coalspur Formation
  - Kbz Brazeau Formation
- Other Features**
- Coal
  - Till
- Legend (Detail)**
- Mine Permit Boundary**
- Coal Valley Base Mine
  - Mercoal East
  - Mercoal West
  - Robb Trend
  - South Block
  - West Extension
  - Yellowhead Tower



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Cross Section Comparison Line F-F'</b>		
DRAWN: JG	CHECKED: EG	FIGURE: <b>12</b>
DATE: Jun 13/13	PROJECT: 08-041B	



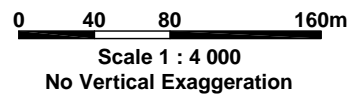
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DRAWN: JG		FILE: ..Final Docs\08-041B\Comp Study\Graphs.dwg	
CHECKED: EG		FIGURE: <b>3</b>	
DATE: Jun 14/13			
PROJECT: 08-041B			



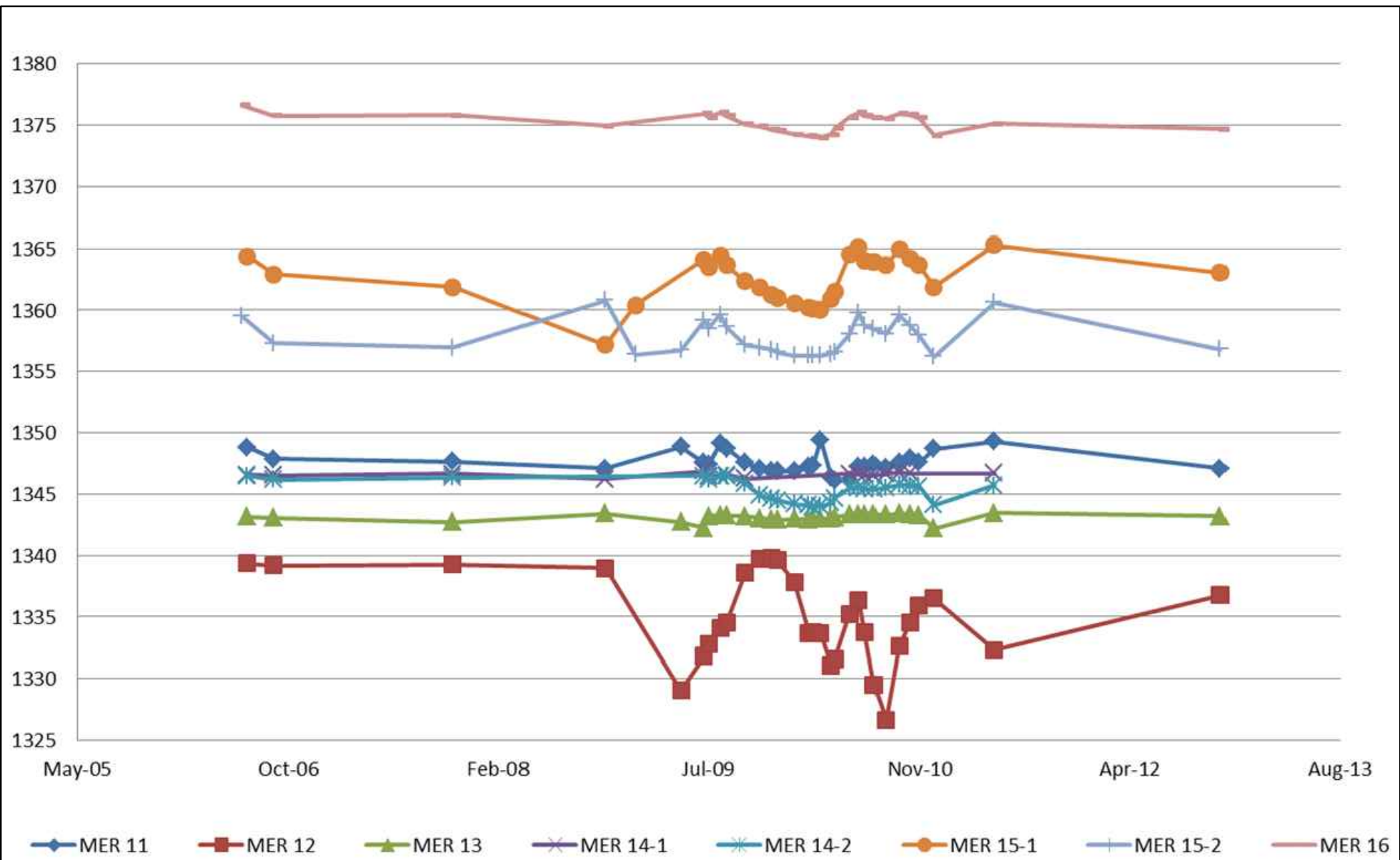
**Legend**


**Formation**

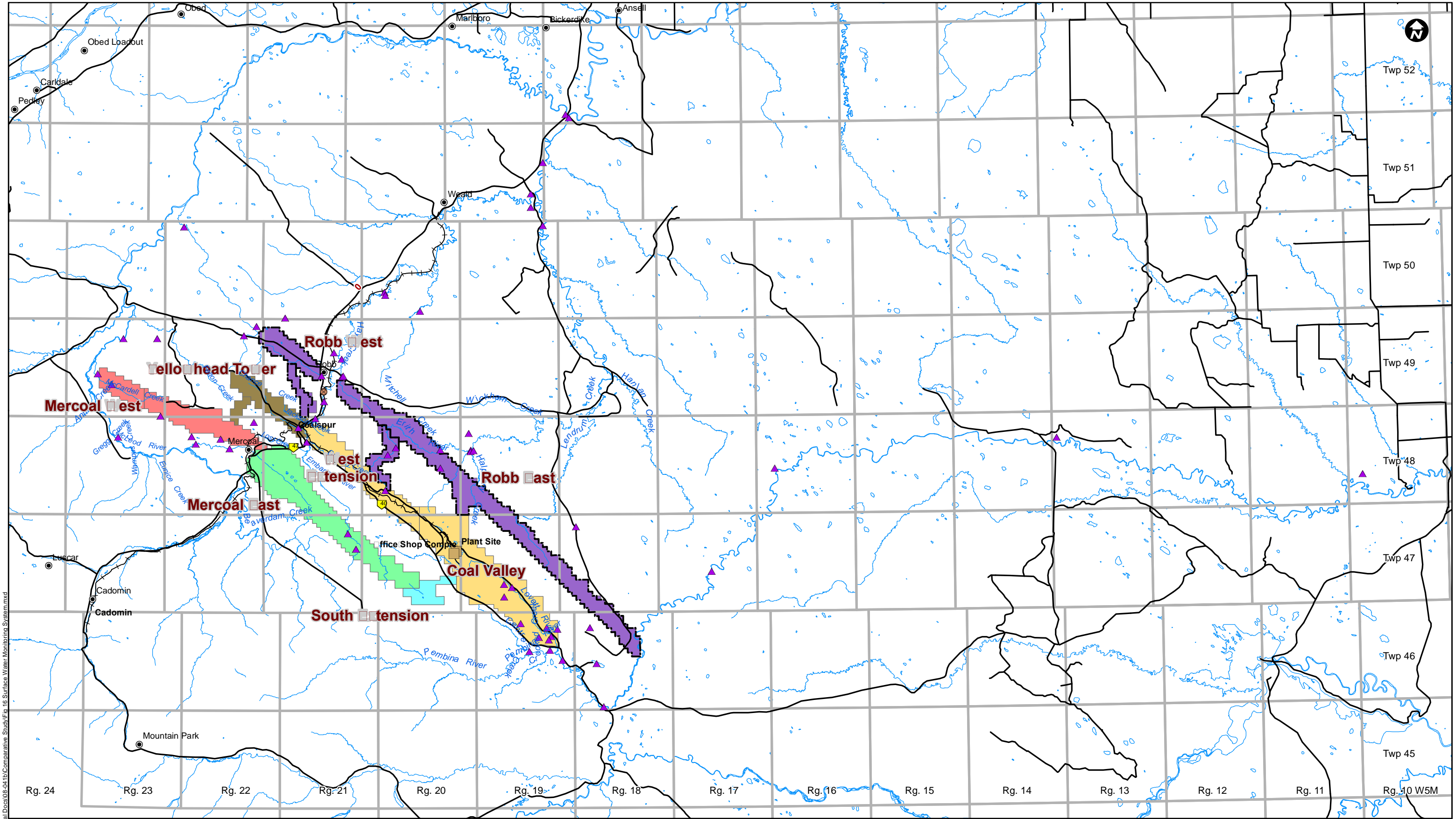
- |   |   |   |
|---|---|---|
| <span style="background-color: yellow; border: 1px solid black; padding: 2px;">Tp</span> Paskapoo Formation   | <span style="background-color: black; width: 20px; height: 10px; display: inline-block;"></span> Coal | <span style="color: blue;">←</span> Groundwater Flow Direction          |
| <span style="background-color: orange; border: 1px solid black; padding: 2px;">TKcp</span> Coalspur Formation | <span style="background-color: brown; width: 20px; height: 10px; display: inline-block;"></span> Till | <span style="color: green;">—</span> 1340 Contour of Hydraulic Head (m) |
| <span style="background-color: green; border: 1px solid black; padding: 2px;">Kbz</span> Brazeau Formation    |   | <span style="color: red;">MER #11</span> Piezometer Site                |



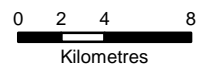
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DRAWN: AD/JG	CHECKED: EG	FIGURE: <b>14</b>
DATE: Jun 14/13	PROJECT: 08-41B	



PROJECT: <b>Coal Valley Mine          Robb Trend SIR - Comparative Study</b>			
TITLE: <b>Apparent drawdown due to          Pit 23 dewatering</b>		FILE: ..Final Docs\08-041B\Comp Study\Graphs.dwg	
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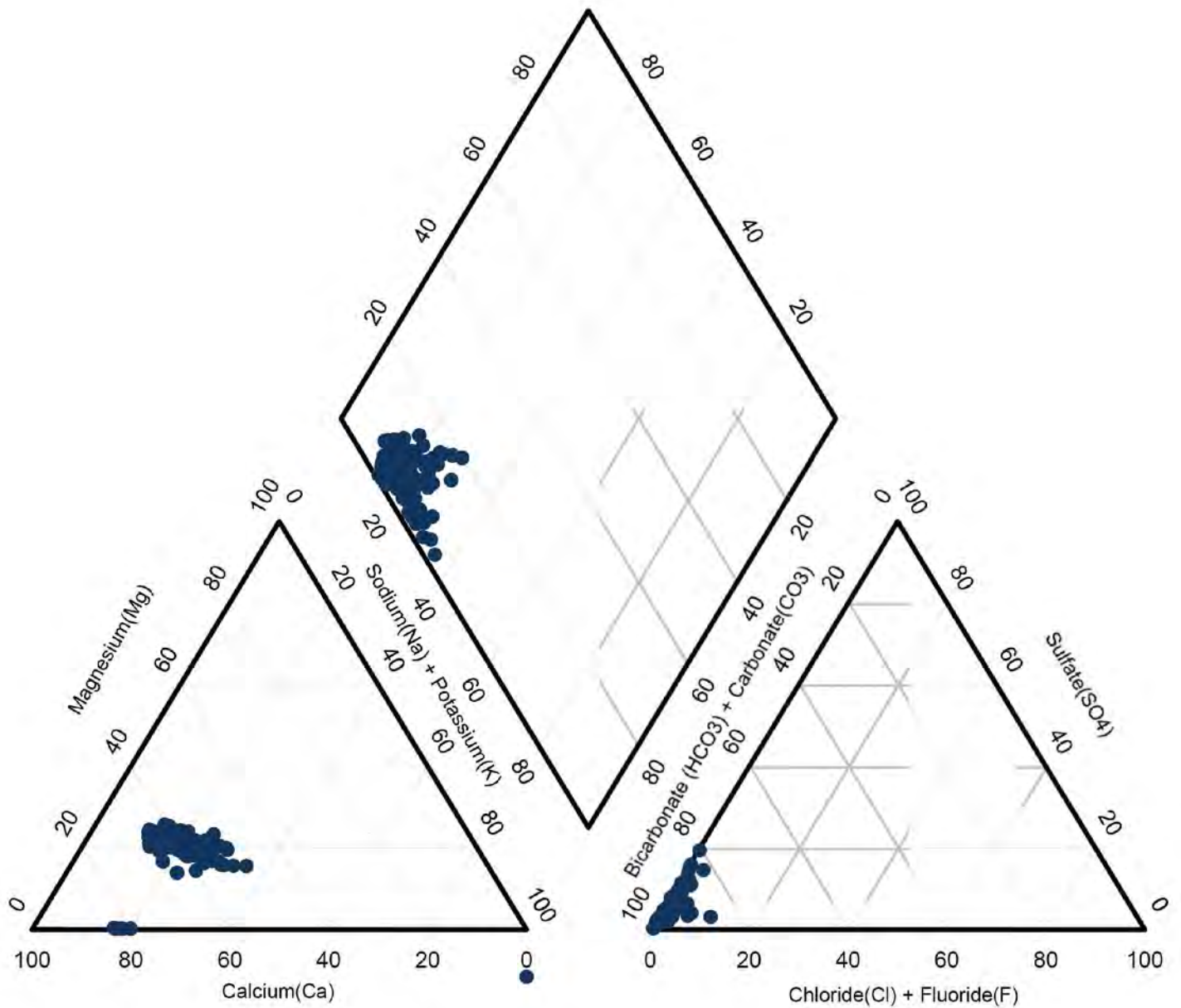



- Legend**
- ▲ Surface Water Location
  - Coal Valley Mine
  - Mercoal East
  - Mercoal West
  - Robb Trend
  - South Block
  - Yellowhead Tower
  - Coal Valley Operational Mine Area

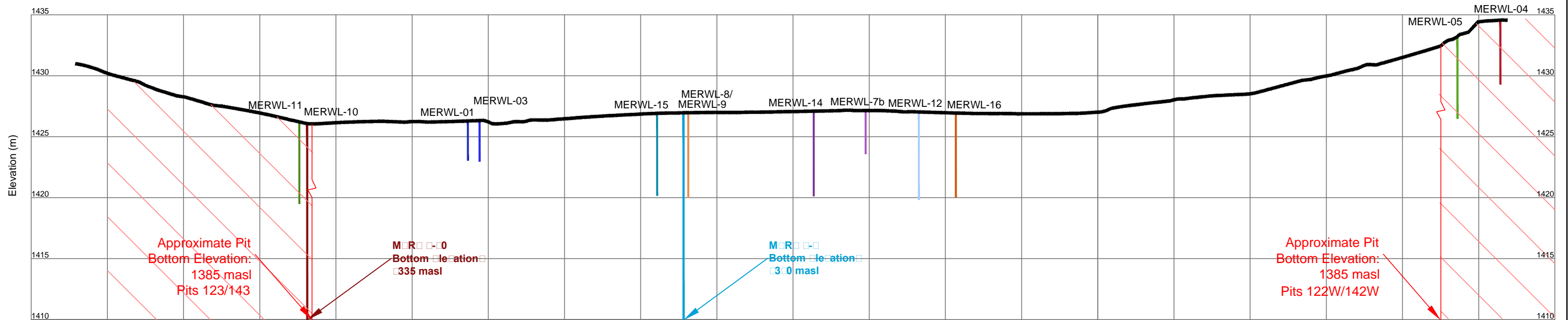
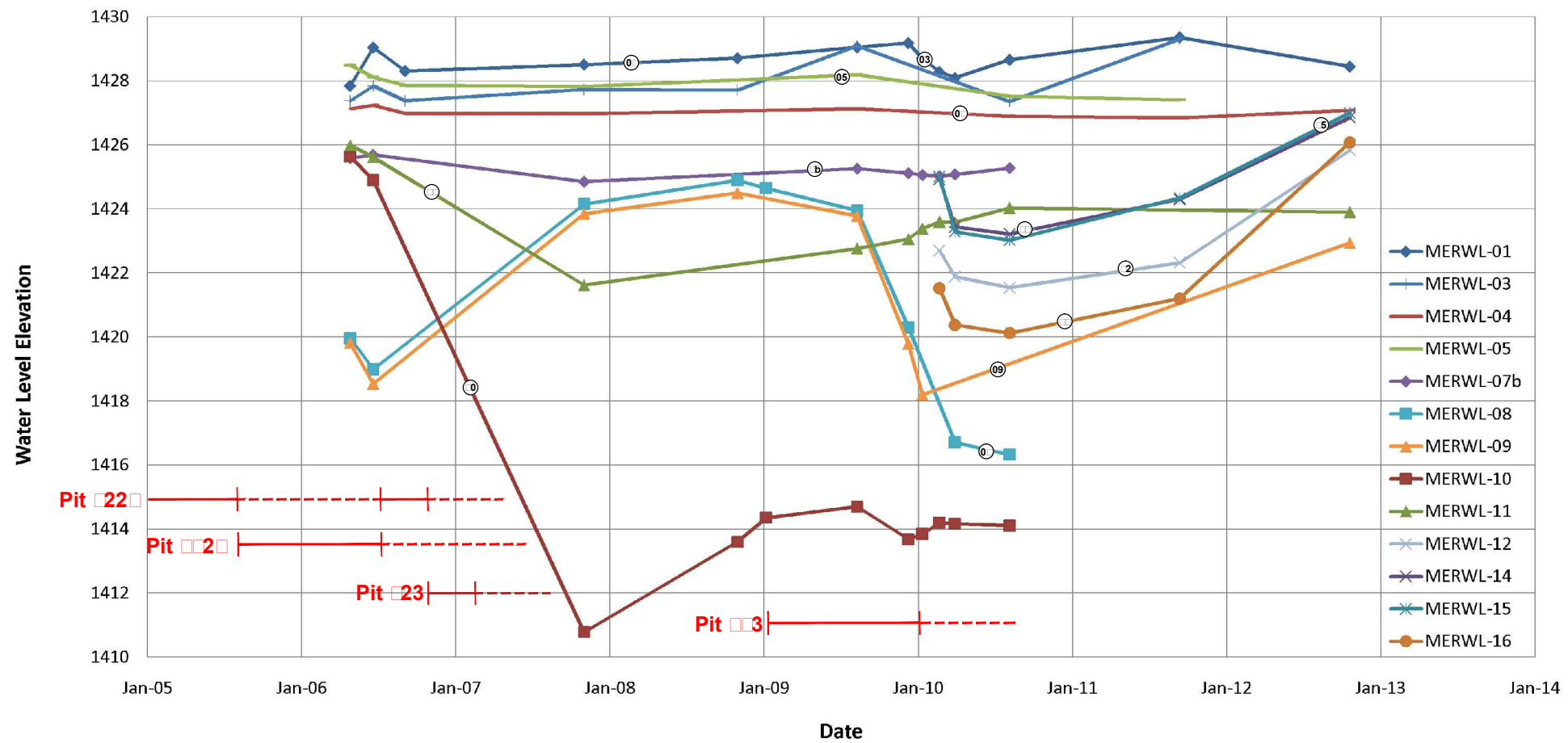


PROJECT: <b>Coal Valley Mine          Robb Trend SIR - Comparative Study</b>		
TITLE: <b>Regional Surface Water Monitoring          Locations</b>		
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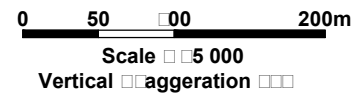


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**Legend**

- Pit within 500 of Wetland
- Pit Inactive



PROJECT: <b>Coal Valley Mine Robb Trend SIR - Comparative Study</b>		
TITLE: <b>South Wetland Hydrograph and Cross Section</b>		
DRAWN: JDC/JG	FIGURE:	
CHECKED: EG		
DATE: Jun 13/13		
PROJECT: 08-041B		

**ESRD Appendix 19**

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REVIEW OF LONG TERM GEOTECHNICAL  
STABILITY OF MINE SPOIL PILES



**REVIEW OF  
LONG TERM GEOTECHNICAL STABILITY  
OF MINE SPOIL PILES**

**Prepared For**

**Ministry of Energy, Mines and Petroleum Resources**

**British Columbia**

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**August, 1995**

**CG25038**

## PROJECT SUMMARY

This report provides a review of processes and experiences related to the long term geotechnical stability of mine waste spoils. The work is presented in the context of its usefulness for the British Columbia mining industry. Mining in British Columbia is carried out mostly in "hard rock" as opposed to "soft rock" formations. The important distinction is that "hard rock" materials tend to form non-cohesive spoil materials and that "soft rock" materials tend to produce cohesive spoils. Non-cohesive spoils are generally better draining materials and are far less susceptible to degradation processes.

A distinction between soil-like and rock-like materials is very useful for assessing the behaviour of non-cohesive spoil. The difference can be made based on sand content (< 2 mm), with 20% sand content forming the approximate break between the two types of materials.

A key contribution of this report has been the compilation of information related to the degradation of argillaceous spoil materials. It is shown that non-cohesive argillaceous spoils do not tend to break down to the constituent particle size. Rather, break down seems to be limited to chip sized particles (greater than 5 mm) as a result of intense drying followed by wetting which causes "air breakage". In soil-like materials, this process seems to be restricted to the near surface zone (approximately 1-2 m below the surface).

A review of experience related to flowslides in British Columbia and UK coal mine spoil piles shows that incidences of flowslide are dramatically reduced following construction. It appears that time dependent settlement (perhaps due to wetting) acts to reduce or eliminate brittleness in loosely placed soil-like spoil materials.

There were no case histories located indicating that non-cohesive metal mine waste dumps exhibit long term stability problems.

Further work should concentrate on the manner in which water tables can develop with time in a waste dump. A better understanding of waste pile stratigraphy will be important in this regard.

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## 1.0 INTRODUCTION

### 1.1 OBJECTIVES

In British Columbia, reclamation and closure regulatory policy (British Columbia Ministry of Energy, Mines and Petroleum Resources, 1990) for mine spoil piles states that mine spoil piles shall be fully reclaimed to ensure:

1. An adequate factor of safety for long term deep-seated and surficial stability.
2. Long term erosion control.
3. Acceptable quality for any water to be released from dumps.
4. Achievement of land use and productivity objectives.

This study addresses issues related to items 1 and 2 above by examining time dependent processes that could affect geotechnical stability. For the most part, time is considered in an engineering context rather than a geological context.

The objective of this study is to assess the current understanding of long term mine spoil pile stability by reviewing and documenting the influence of time, weathering, fines, and consolidation on the phreatic surface and physical stability of spoil piles as described by the experiences of others at relevant sites around the world. The report reviews the processes of weathering and self-weight compaction and the effect these have on fines generation and long term shear strength.

This report provides terms of reference for assessing current state-of-practice and for establishing requirements for further research. Supplementary information related to the flow of water through waste rock piles is contained in a report entitled "Hydrogeology of Waste Rock Dumps" (Smith et al, 1995).

### 1.2 SCOPE

The scope of the review has been to include information which can be applied to the mining scene in British Columbia (BC). This includes mine waste rock dumps (also referred to as spoil piles throughout this report) at both metal mines and Rocky Mountain coal mines. The emphasis is on the long term processes that affect stability conditions within the waste material itself. Processes that affect foundation conditions were not addressed.

The primary sources of information for this study were obtained from the following sources which tended to be associated with integrated research programs:

- Western Canada: Rocky Mountain coal mines and BC metal mines
- Eastern USA: Appalachian coal mines

- United Kingdom: Coarse discard spoil piles from underground coal mines
- Australia: Coal mines mainly in the Bowen Basin
- Rockfill dams: Mainly dumped rockfill dams in the USA and UK

Much of the data on long term behaviour relates to coal mining operations in Western Canada, the Eastern USA, the United Kingdom, and Australia. Outside of BC, many of the coal mine spoils are comprised of very weak argillaceous rocks that break down readily in the presence of water. These cohesive type materials are not considered to be particularly relevant to the BC situation and thus have not been as carefully considered as the cohesionless materials. For this reason, the vast amount of information that is available from the Western Canadian Prairie coal mines and oil sands mines was not reviewed.

Many of the more useful papers are linked to broadly based research programs. For example, significant research on colliery coarse discard piles was carried out in the UK between 1966 and 1984, after the Aberfan flowslide disaster. The Aberfan coarse discard flowslide lead to several investigations that resulted in new legislation regarding construction of coal mine waste piles in the U.K.

Following the failure of several large embankments in the USA, comprehensive investigations into the use of shale for highway embankments were launched at Purdue University and the Waterways Experiment Station in the mid 1970's. Changes in regulatory requirements following the introduction of the Surface Mining Control and Reclamation Act in 1977 led to a number of waste rock durability studies in the Appalachian coal mining area.

Relatively few references dealing with spoil piles at metal mines were located. In particular, there is virtually no information related to the long term physical stability of metal mine waste piles.

Case histories of early rockfill dam construction provided useful information on the behaviour of loosely dumped durable rockfill.

Inquiries were also carried out for information related to geotechnical performance of waste piles in Poland, the Czech Republic, and East Germany. Much of the coal mining in these countries is carried out in very weak rocks and thus this information is not particularly relevant. Information on "hard rock" waste piles from the Eastern European countries could not be obtained, presumably because few problems exist for these piles.

### 1.3 DESIGN TIME FRAME AND HAZARDS

Matters related to a suitable design time frame are fundamental to issues of long term stability. This is a difficult matter for engineers used to dealing with time frames in the order of 50 years or so. It is important to distinguish between engineering time frames (say 50 to 100 years) and geological time (measurable in thousands or millions of years). This study is mainly concerned with engineering time frames. Some perspectives on design time frames are offered below.

#### 1.3.1 Regulated Time Frames

Three jurisdictions where time frames are stipulated for mine closure are as follows:

1. In the US, the Uranium Mill Tailings Control Act stipulates that control of tailings shall be effective for up to 1000 years to the extent reasonably achievable and in any case, for at least 200 years.
2. In Ontario, the Rehabilitation of Mines Guidelines for Proponents (Ontario Ministry Northern Development and Mines, 1992) stipulates that closure plans should consider a minimum of 200 years (closure plans must consider at least a minimal risk consequence criteria) and 2000+ years where the consequences of failure are substantial. An earlier (draft) version of the Ontario guidelines stipulated a 10,000 year design time frame where the consequences of failure are substantial. This requirement seems to have been relaxed to the 2000+ level in the most recent guidelines.
3. Current research for the design life for permanent disposal of high level radioactive waste in Canada and the US is considering design time periods of 10,000 years or more.

#### 1.3.2 Hazard Based Time Frames

Current practice for chronic release suggests that the time frame should be relative to the length of time that the hazard is present. Current practices for abandoning minesites subject to acid mine drainage problems are illustrative of this approach. Recent guidelines for acid rock drainage in BC state "it is not yet possible to completely abandon acid-generating mines without requiring long-term programs to collect and treat acid rock drainage or to maintain prevention and control measures" (British Columbia Reclamation Advisory Committee, 1993). The length of the post-closure design time frame is tied to the time frame that the hazard is present.

## 1.4 HAZARDS

It is recognized that geotechnical hazards can result from two different types of initiating events: extreme events with a low probability of occurrence and perpetual forces that occur frequently. The current practice for assessing extreme events is well established and is largely statistically based. Current practice for assessing effects of perpetual forces is much less developed and is judgementally driven. A brief discussion on each of these hazard classes follows:

1. **Extreme Events:** Extreme events include earthquakes, floods, droughts, high winds, and forest fires. The design for extreme events commonly involves estimating the probable maximum event or determining the probabilistic return time interval. Table 1.1 shows earthquake design criteria adopted by BC Ministry of Mines. The table demonstrates that the design extreme event is chosen based upon the consequence of failure.

Design for floods takes a similar approach to that for earthquakes in that the design flood event is related to the consequence of failure. Table 1.2 shows criteria from the Ontario guidelines. In most cases tailings impoundment structures must be designed for the Probable Maximum Flood (PMF).

2. **Perpetual Disruptive Forces:** Perpetual disruptive forces include erosion (water and wind), frost action, root penetration, physical/chemical degradation, and animals (for example: beaver dams). In relatively dry aseismic areas, consideration for perpetual disruptive forces may dominate the design considerations. Design considerations for perpetual disruptive forces are not normally considered statistically.



<b>TABLE 1.1                      PROPOSED DESIGN EARTHQUAKES                      FOR TAILINGS DAMS                      (BC Ministry of Mines, 1993)</b>			
<b>Loss of Life</b>	<b>Economic loss, Socio-economic and Environmental Impacts</b>	<b>Consequence Category</b>	<b>Abandonment Design Earthquake (ADE)</b>
No loss of life expected. Typically no permanent structures for human habitation inundated.	Minimal economic loss such as farm buildings, limited damage to agricultural land, minor roads, etc. Minor damage to recreational facilities and fisheries resources.	Low	1/475
No loss of life expected but the possibility recognized. Typically no urban development and no more than a small number of habitable structures downstream inundated.	Appreciable economic loss, including possible damage to secondary roads, minor railways, relatively important public utilities. Damage to recreational or cultural facilities. Some damage to fisheries resources.	Significant	75% MCE***
Loss of life expected. Typically inundated areas downstream areas include communities or other significant development.	Excessive economic loss such as possible serious damage to communities, industrial, commercial or agricultural facilities, highways primary roads, main railways, important utilities or other dams downstream. Major damage to recreational or cultural facilities and fisheries resources.	High	MCE

\*\*\* The peak accelerations and velocities are to be taken as 75% of the MCE but the annual probability of exceedance should be less than 1/1,000.

MCE = Maximum Credible Earthquake

TABLE 1.2 MINIMUM DESIGN INFLOW FLOODS FOR DAMS (Ontario Ministry of Northern Development, Version 1-2; 1992)						
Size						
Small	Intermediate				Large	
	Height	Storage	Height	Storage	Height	Storage
Hazard Potential	7.5 m or <25 ft	< 100,000 cu. m or 80 ac.ft	<7.5 m or <25 ft	100,000 to 1,000,000 cu.m or 80-800 ac.ft	> 15 m or >50 ft.	> 1,000,000 cu.m or >800 ac.ft
Damage to Dam Only	25 to 50 year return		50 to 100 year return		100 to RF	
<b>LOW</b> Loss of Life: None Property Damage: Minimal to agriculture, other dams or structures not for human habitation. None to residential, commercial, industrial or land to be developed within 20 years.	25 to 50 year return		100 to RF		RF to PMF	
<b>SIGNIFICANT</b> Loss of Life: None expected Property Damage: Minimal to agriculture operations, other dams or residential, commercial, industrial development or land to be developed within 20 years.	100 to RF		RF to PMF		PMF	
<b>HIGH</b> Loss of Life: One or more Property Damage: Extensive to agricultural operations, other dams or residential, commercial, or industrial development.	RF TO PMF		PMF		PMF	

Legend: 25 = 25 year return period flood RF = Regional Flood PMF = Probable Maximum Flood < = less than > = greater than

This report considers processes that could affect long term geotechnical stability. The emphasis is on perpetual disruptive forces such as weathering and erosion. The discussion presented above indicates that design associated with extreme events is amenable to fixed design life periods. There would appear to be some significant differences in current trends towards actual regulated time frames. Design life associated with perpetual disruptive forces is perhaps best tied to the design life of the hazard. There would seem to be few precedents for design in this regard.

## 2.0 BACKGROUND

Most mine waste dumps in Western Canada can be broadly classified into one of five different categories according to material type:

- Metal mine waste rock dumps
- Rocky Mountain coal mines
  - waste rock dumps
  - coarse coal refuse dumps
- Prairie coal mine waste rock dumps
- Non-lithified or highly weathered overburden dumps

In BC most waste dumps are either metal mine or Rocky Mountain coal mine waste rock dumps. Rocky Mountain coal mine waste rock is distinguished from metal mine waste rock by a generally greater proportion of lower strength rock types (shales and lower strength siltstone) and from the prairie coal mine waste rock by the presence of higher strength sandstones and siltstones. In addition the shale materials in the Rocky Mountain coal mines do not tend to produce a cohesive waste material as opposed to the bentonitic materials contained in the Prairie coal mine waste rock dumps. Note also that overburden dumps are present at all mine sites. Non-lithified (often termed unconsolidated) overburden materials are not always separated from waste rock materials and sometimes comprise large percentages of waste rock dumps.

## 2.1 SPOIL MATERIAL CLASSIFICATION

Figure 2.1 shows grain size distributions for BC mine waste rock (also referred to as mine spoil) materials obtained from different sources. The figure shows that there is a very wide range of materials present in BC waste rock dumps ranging from silty and sandy gravels to cobbles and bouldery material that does not contain any sands or gravels. The wide range of material up to very large grain sizes and the distribution of these materials in a waste dump poses problems for characterizing mine spoils.

For comparison with BC spoil materials, Figure 2.2 shows grain size distributions obtained from sources outside of BC. This information was obtained from coal mine spoil piles in the UK and the Eastern US. Most of these materials consist of gravel sizes and smaller. In general, the BC coal mine spoil shows a much broader range of grain sizes than other coal mine waste rock materials with a larger percentage of coarser material.

Additional information on mine spoil grain size distributions is contained in the Pit Slope Manual (CANMET, 1977);. Waste rock samples obtained from 11 mine sites across Canada exhibited sand contents (<2 mm material) ranging from 10 to 78%. This information seems to be biased towards finer grain sizes, possibly as a result of sampling only from the crests of the piles.

It is useful to differentiate between soil-like and rock-like materials. In rock-like material, the mechanical behaviour is controlled by the point to point contacts between the coarse rock fragments. Groundwater flow takes place through fairly large voids between the coarse rock particles. In soil-like spoil, the larger fragments 'float' in a matrix of soil particles and the mechanical and hydraulic behaviour is controlled by the properties of the sandy matrix. In soil-like materials, the larger fragments do not significantly influence mechanical and hydraulic behaviour and act mainly to reduce overall porosity. Thus addition of coarse particles to a soil-like spoil actually reduces hydraulic conductivity up to the point that the coarse particles start to interact with one another.

Based on work by Strohm et al (1978), The Office of Surface Mining Reclamation and Enforcement in the USA, (OSM, 1982) indicates that spoils with more than 20 percent material passing the No. 4 sieve (4.75 mm particle size) or slakeable rock should be considered as soil-like. Work by Fragaszy et al (1992) indicates that materials with in excess of 50 to 60 percent finer than 12.7 mm behave in a soil-like manner. Dawson and Morgenstern (1995) differentiate this behaviour on the basis of sand content (less than 2 mm grain size), with a sand content of about 20% forming the boundary between rock-like and soil-like materials. These different criteria all lie within the same range (see Figure 2.2), at about the 10 to 30% sand content boundary.

Soil-like behaviour can be further subdivided into cohesionless and cohesive types. Cohesionless spoils comprise sandy gravels and gravelly sands which display drainage and strength characteristics consistent with granular materials. Cohesive materials are exemplified by spoils containing a large percentage of swelling clay minerals that readily interact in water. These types of materials are particularly sensitive to weathering effects. These materials may not comprise a large proportion of cohesive mine spoil material in BC waste piles.

## 2.2 BRITTLE VS DUCTILE FAILURE MECHANISMS

Mine waste dumps are not normally fluid containment structures and thus can remain serviceable as waste storage piles even when large deformations are taking place. For waste dumps, it is the highly mobile, accelerating, and rapidly initiating failures that present potentially serious safety and environmental hazards.

The potential mobility of a sliding mass is mainly related to the failure geometry and material brittleness. Failure of ductile materials will not add additional energy to the driving force of a failed mass whereas progressive failure of brittle materials might result in an excess driving force at failure. There are several different processes that can result in brittle failure. Recent studies of flowslides in Rocky Mountain coal mine waste dumps suggests that the most important brittle mechanism for mine waste dumps is the collapse process which can result in a liquefaction flowslide. Hutchinson (1988) has defined a liquefaction flowslide as :

*"characterized by the sudden collapse and extensive, very to extremely rapid run-out of a mass of granular material or debris, following some disturbance. An essential feature is that the material involved has a metastable loose or high porosity structure. As a result of the disturbance, this collapses transferring the overburden load wholly or partly onto the pore fluid, in which excess pressures are generated. The consequent loss of strength gives the failing material briefly a semi-fluid character and allows a flow slide to develop."*

In terms of consequences, the high mobility of flowslides render them far more dangerous than other types of waste dump failures, as exemplified by the disastrous Aberfan flowslide in South Wales in 1966.

## 2.3 SPOIL PILE STABILITY

Factors influencing the stability of spoil piles are shown in Table 2.1. These are differentiated as site conditions and design details. It is generally not practical to modify site conditions except on a minor scale. However, there are a number of measures that could be incorporated into dump design to improve both short and long term stability. Items that can affect the long term stability are also shown in Table 2.1.

TABLE 2.1 FACTORS INFLUENCING SPOIL PILE STABILITY			
FACTORS		CAN BE CONTROLLED DURING CONSTRUCTION	CAN CHANGE WITH TIME AND AFFECT LONG TERM STABILITY
Site Conditions	<ul style="list-style-type: none"> <li>- foundation (soil/rock)</li> <li>- groundwater conditions</li> <li>- slope angle</li> <li>- climate</li> <li>- seismicity } extreme events</li> <li>- floods }</li> </ul>		<p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p>
Spoil Pile Design and Construction Details	<ul style="list-style-type: none"> <li>- spoil type (mine process, durability)</li> <li>- configuration; resloping (height, slope angle)</li> <li>- placement density (end dumped or lifts)</li> <li>- rate of placement</li> <li>- waste material zonation</li> <li>- internal drainage (free draining material or zones eg at base)</li> <li>- surface water control (cap, interceptor ditches)</li> </ul>	<p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p>	<p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p> <p style="text-align: center;">X</p>

Table 2.2 shows a listing of interrelated processes considered to have a potential impact on long term geotechnical stability. Most of this report examines the processes of self weight compaction and rock degradation and how these relate to instability. Some discussion on erosion is also presented. Extreme events are not dealt with in this report as they are not uniquely related to long term effects and thus are a different class of problems. One of the focuses of this report is the effects of long term processes on the shear strength and permeability of non-cohesive mine waste dump materials. It is considered that changes in permeability are particularly important as long term water table conditions are affected by time dependent permeability processes.

**TABLE 2.2 PROCESSES THAT EFFECT LONG TERM SPOIL PILE STABILITY**

PROCESS	DESCRIPTION	EFFECTS	IMPLICATIONS
1) Self weight compaction a) Normal compression	- particle rearrangement - particle crushing	- increase in density and decrease in void ratio - increase in fines - above items cause decrease in hydraulic conductivity	a) Settlement may disrupt surface drainage b) increased resistance to liquefaction c) increase in shear strength d) decreased internal drainage; may cause water table to develop in the spoil pile
b) Compression due to wetting (sometimes termed 'collapse' settlement)	- increased compression when dry or partly saturated materials are saturated	- sudden compression	
2) Rock Degradation a) Physical Breakdown	- mechanical handling - wetting and drying (swelling and capillary effects) - freeze/thaw	- increase in fines and decrease in hydraulic conductivity - decrease in shear strength	- Item (d) above e) decrease in shear strength f) may decrease infiltration near surface g) decreased resistance against surface erosion
b) Chemical Weathering	- oxidation of sulphides - dissolution of cementation (often calcite)		
3) Erosion a) Surface Erosion	- surface runoff	- gully erosion and change in surface drainage pattern	h) movement of waste material off site l) disruption of surface drainage measures and revegetation
b) Seepage Erosion	- fines migration and drainage clogging	- disruption of internal drainage	j) item (d)
4) Extreme events a) Seismic loading	- increased loading (cyclic shear stresses)	- possible excess pore pressures; possible collapse and liquefaction of spoil	k) may lead to large displacements or flowslide type failure
b) Floods/high rainfall	- high surface runoff	- increased erosion - increased infiltration	- Items (d), (h), (l) and (j)

## 2.4 COMPARISON OF INFORMATION SOURCES

In evaluating the usefulness of information from other parts of the world to the B.C. situation, it is necessary to appreciate the different lithologies, mining methods and dump construction methods used in these areas. The following sections provide basic information on spoil piles in BC, the UK, Eastern USA and Australia. A comparison of the different locations is included in Table 2.3.

### 2.4.1 British Columbia

Waste dumps in BC are mostly present at surface (open pit) mines, which are located mainly in mountainous or steeply sloping terrain. They are found at coal mines in the Rocky Mountains and metal mines elsewhere in the province. The spoil material comprises blasted overburden rock although the coal mine operations often have coarse coal refuse piles that comprise processed material from wash plants, similar to the coarse discard in UK spoil piles. Most of the spoil piles are constructed as end dumped fills although some critical dumps and coal refuse dumps are constructed in compacted lifts. Figure 2.1, discussed previously, shows grain size distributions derived from different sources.

Most of the stability problems in B.C. mine spoil piles have been associated with the Rocky Mountain coal mines. The incidence of stability problems at metal mines is far less frequent as exemplified by the scarcity of recorded case histories in the literature. The Rocky Mountain coal mine dumps consist of waste rock materials derived from interbedded sandstone, siltstone, and shale rock types (see Table 2.4). Variable quantities of low grade coal (or highly carbonaceous shale) may also be included in the dumps.

The BC coal mine dump rock has highly variable jointing and strength properties. Typical values for uniaxial compressive strength are shown in Table 2.4. This indicates the wide range of intact rock strength within and between lithologies. The highly variable jointing, combined with the large range in intact rock strength, probably accounts for the large and unique variation in grain sizes observed at the Rocky Mountain coal mine waste dumps.



**TABLE 2.3 COMPARISON OF SPOIL PILES**

		British Columbia			Appalachian Area, USA	United Kingdom, 'old' coarse discard piles (pre-1971)
		coal mine waste rock	coarse coal refuse	metal mine waste rock		
<b>Mining method</b>		- open pit/surface		- open pit	- surface; many contour strip mines	- underground
<b>Spoil Pile Details</b>	- placement	- mostly end dumped	- compacted lifts	- end dumped and push dumped	- often use cut and rollback method with no compaction	- end dumped
	- height	- up to 400 m	- up to 170 m			- 30 to 75 m
	- angle	- 37°	- 23°	- 37°	- 20 to 60 m typical	- 25° to 33°
	- reclaim slope	- 26°	- 23°	- 26°	- approximate original contour; up to approx 34°	- 25° to 33°
	- drainage	- base drainage due to segregation when dump heights greater than 50 m	- no segregation	- base drainage due to segregation	- minimal segregation and no base drains in pre 1977 spoil piles	- no segregation, no base drainage
<b>Lithology (Uniaxial compressive strength, [MPa])</b>		Sandstone 80-120 Siltstone 40-80 Shale 10-40  (Dawson & Morgenstern, 1995)	- carbonaceous content 35 to 60%	fresh and altered igneous and metamorphic rocks. Variable uniaxial strength but usually 50 to 100 MPa	Sandstone/limestone 40-200 Siltstone 3-30 Shale 3-30 Mudstone 1-20  (Andrews et al (1980))	Siltstone 20-30 Shale 1-15 - average carbonaceous content 13%  (Taylor (1988))
<b>Spoil Material</b>		- blasted rock  - gradation highly variable; 500 mm minus typical but with layers of fine material (150 mm minus) parallel to dump face	- coal refuse from wash plant - 75 mm minus; relatively homogeneous gradation	- blasted rock  - generally coarse, durable rock, 500 mm minus	- blasted rock - rock is weak and readily breaks down with handling giving fine, soil like spoils	- coarse discard run of mine or from wash plant - 75 to 100 mm minus - spoil is relatively homogenous within a particular dump

The larger proportion of low strength argillaceous rocks in Rocky Mountain coal mines can give rise to layers of fine material (sandy gravel sizes) in spoil piles as noted by Dawson & Morgenstern (1995). These materials are thought to be a major cause of instability in coal mine waste dumps (Golder, 1987; Dawson and Morgenstern, 1995).

Piteau (1991) surveyed a total of 84 spoil piles at 31 B.C. mines (10 coal mines and 21 metal mines). Lithologies in the coal mines are summarized in Table 2.4. Lithologies in the metal mines were highly variable including andesite, argillite, serpentine, granodiorite and quartzite. Uniaxial compressive strengths in the metal mines were not as high as might be expected. Most ranged from 50 to 100 MPa but some were as low as 10 to 20 MPa and as high as 175 MPa. Typical gradations of the waste rock materials were as follows:

<u>Mine Type</u>	<u>Material</u>	<u>% Greater than 300 mm</u>	<u>% Passing #200 Sieve</u>
Coal	Sandstone	60 - 70	<2
	Mudstone	10 - 40	2 - 20
Metal	Unspecified	10 - 30	<5

Gradations for the metal mine waste rock were variable due to the diversity of lithologies. In a number of cases overburden soils were mixed with the waste rock giving up to 25 passing the No. 200 sieve.

It has been well documented (Golder Associates, 1987) that end dumping of typical coal mine waste causes the material to segregate with the coarser sandstone boulders rolling down to the toe and the finer sands and gravels remaining near the crest. Crest materials generally have grain sizes of between 1 and 30 mm (sand and gravel size) while the coarser toe materials have grain sizes of between 150 and 600 mm (boulder size). This segregation results in a well defined stratigraphy comprising a fine-grained crest and an initially free draining toe.

Coarse coal refuse is another waste product at most coal mines. A typical range of gradations is shown in Figure 2.1. It can be seen that the grain size distribution is similar to the fine sandy gravel material in poor quality waste rock in B.C. coal mine spoil piles. It is also similar to the coarse discard in UK coal mines. A feature of the B.C. coarse coal refuse is the high carbonaceous content (35 to 60 percent). This gives a range in specific gravity of 1.6 to 2.1. By comparison the specific gravity in UK coarse discards is 1.6 to 2.8 with an average of 2.3 (Taylor, 1987).

#### **2.4.2 United Kingdom**

The spoil piles consist of coarse discard from underground coal mining operations. The material comprises coal and Coal Measures rocks from the roof and floor of the mined seam. These materials are mudstones and shale and the average clay minerals content is about 70 percent (see Table 2.5). The coarse discard leaving the washing plant is typically 75 to 100 mm minus. The range of gradations is shown in Fig. 2.2. Traditionally, the spoil piles were constructed by end dumping or by aerial ropeway. Since 1971, dump construction has been strictly regulated and all spoil piles have been constructed in compacted lifts, less than 5 m thick. The information presented in this report relates to the pre-1971 end dumped spoil piles.

#### **2.4.3 Eastern USA**

Most of the information reviewed in this report relates to Appalachian contour strip mining coal mines. The spoil material is generally pushed back over the highwall (cut and rollback method) forming a loose fill material which is typically 20 to 60 m deep. The spoil material is therefore generally founded on the horizontal floor of the old mine. Lithologies are highly variable throughout the Appalachian region, however, much of the spoil is derived from argillaceous rocks as shown in Table 2.6. These rocks are often very weak and give rise to cohesive soil-like spoils, in some cases with 20 to 50 percent passing the No. 200 sieve. Fig. 2.2 shows the range of gradations from spoil materials in the Eastern USA.

#### **2.4.4 Australia**

There has been a large amount of research carried out at the Australian strip coal mines, mainly in the Bowen Basin. Many of the materials at these mines break down in the presence of water and can be considered to be cohesive spoil material. The research carried out to examine spoil pile stability contains useful information comparing the strength loss due to weathering in cohesionless versus cohesive mine spoil materials.

In general, the argillaceous waste rock from Rocky Mountain coal mines is stronger and less friable than the Coal Measures rocks in the UK and the waste rock in the Appalachian coal mines. The Rocky Mountain spoil piles contain both soil-like and rock-like materials. The spoils in the UK and USA comprise weaker rocks that produce fine soil-like spoils which make up the entire dump. As indicated on the gradation curves (Fig. 2.2), these fine spoils are very similar to the material making up the fine sandy gravel layers in the Rocky Mountain spoil piles (Fig. 2.1). Accordingly, the UK and USA spoil piles may be considered as a worst case and information they provide on rock degradation and other long term processes can be considered relevant to the behaviour of the soil-like finer materials in the BC coal mine dumps.

<b>TABLE 2.4 LITHOLOGY OF ROCKY MOUNTAIN COAL MINE SPOIL SAMPLES</b>				
<b>Percent by Weight (From Dawson &amp; Morgenstern, 1995)</b>				<b>U.C.S. (MPa)</b>
<b>Lithology</b>	<b>Quintette Marmot P1</b>	<b>Greenhills North Dump</b>	<b>Fording South Spoil Rehandle</b>	
Sandstone	20	10	20	80 - 120
Siltstone	25	10	40	40 - 80
Carbonaceous Shale	50	60	40	10 - 40
Coal	5	20	trace	-

<b>Percent by Weight (From Golder, 1987)</b>					<b>U.C.S. (MPa)</b>
<b>Lithology</b>	<b>Site C</b>	<b>Site E</b>	<b>Site F</b>	<b>Site G</b>	
Sandstone	40	55	50	20	110 - 170
Siltstone	40	25	30	40	60 - 110
Mudstone/Shale	20	20	20	40	30 - 80

<b>Percent by Weight (From Piteau, 1991)</b>			<b>U.C.S. (MPa)</b>
<b>Lithology</b>	<b>Data From 8 Mines</b>	<b>Data From One Mine</b>	
Sandstone	20 - 70	5	100 - 150
Siltstone	20 - 50	45	55 - 110
Mudstone/Shale	10 - 30	50	10 - 60

Note: U.C.S. - Uniaxial Compressive Strength

TABLE 2.5 AVERAGE MINERALOGY OF COARSE DISCARDS IN U.K.(Taylor, 1987)		
	percent by weight	
Quartz	17.5	
Illite	31.5	68.5 Clay Minerals
Mixed layer clay	26.0	
Kaolinite	10.5	
Chlorite	0.5	
Carbonates	1.0 *1	
Pyrite	V. Small *2	
Carbon	13.0	

- Note:
- Based on 74 samples from 15 spoil piles
  - \*1 dominantly siderite
  - \*2 sulphates:
    - Av. acid soluble sulphates 0.2% (by wt)  
95% of distrib. between 0.05 and 2.8%
    - Av. water soluble sulphates 0.1%  
95% of distrib. between 0.01 and 0.6%
  - Specific gravity ranges from 1.6 to 2.8 (average 2.31)

<b>TABLE 2.6 LITHOLOGIES IN APPALACHIAN SPOIL PILES</b>				
<b>Percent by Weight (from Andrews et al (1980))</b>				
<b>Lithology</b>	<b>Site A</b>	<b>Site B</b>	<b>Site C</b>	<b>Site D</b>
<b>Sandstone</b>	-	-	30	10
<b>Siltstone</b>	-	70	45	-
<b>Shale/Mudstone</b>	100	30	25	90

<b>Percent by Weight (from Holubec (1976))</b>	
<b>Lithology</b>	<b>percent by weight</b>
<b>Sandstone and Siltstone</b>	0-10
<b>Shale and Mudstone</b>	30-70
<b>Low quality coal and carbonaceous Shale</b>	15-45

### 3.0 LONG TERM PROCESSES

This chapter reviews long term processes that could affect waste dump stability. The review has been divided into the consideration of three different processes: self weight compaction, rock degradation, and erosion. Overburden self weight loads result in compaction settlement which causes particle crushing and increased density (the emphasis here is on the time dependent compaction of coarse rock). Rock degradation refers mainly to weathering processes (both physical and chemical). Erosion includes external and internal processes; external erosion involves particle detachment and movement due to runoff and seepage erosion results in internal migration of fines due to seepage.

Both self weight compaction and degradation involve consideration of the influence of "wetting" on the long term behaviour of waste rock materials. In this report, "wetting" is used to describe the influence of water on the effective strength and settlement behaviour of mine waste materials. Wetting as discussed here is used to describe three different mechanisms:

1. Collapse - Collapse is a brittle process that results due to the breakdown of a meta-stable soil structure. Collapse due to wetting results in a sudden strength loss (and large volume changes) when dry materials become wet. Collapse due to wetting has been observed (Rollins et al, 1994) in collapsible gravels that contain 10 to 30% fines (material passing the 200 Mesh sieve). In these materials, the fines appear to provide sufficient interaction (apparent cohesion due to high surface tensions and weak cementation) with the coarser particles such that a "loose" structure is maintained. The loose structure is sensitive to wetting. Collapse strains due to wetting of 1 to 4% have been documented for natural gravel materials (Rollins et al, 1994).
2. Strength Reduction due to Moisture Ingress - Water can reduce the strength of granular material by reducing the intergranular crushing strength of individual particles. Tests on clean sand by Lee et al (1967) show a 30% strength reduction due to wetting. These authors state that this process is greatest in granular materials containing cracks such as weathered rock and angular materials. Further discussion of this process as it relates to the behaviour of argillaceous rock fragments is contained in this report.
3. Softening - Weak argillaceous rocks are known to breakdown in the presence of water. This results mainly due to swelling of clay minerals and is a function of clay mineralogy and pore fluid composition. This process can result in large volume changes and considerable strength reduction as the rock fragments breakdown down to their constituent particle size.

All the wetting processes result in various degrees of stiffness and strength loss. The material breakdown and compaction that often accompanies wetting can also result in decreased hydraulic conductivity.

### 3.1 SELF WEIGHT COMPACTION

#### 3.1.1 General

It is well established that end dumped rockfills can display significant settlement during construction and also display continued settlement in the long term. Settlement causes a decrease in void ratio and is often associated with the generation of fines due to rock crushing. These factors can lead to decreased permeability and changes in shear strength. There is also evidence that self weight compaction in spoil piles may inhibit collapse mechanisms in fine material and thereby reduce liquefaction flowslide potential.

The purpose of this section is to review the general magnitude of self-weight compaction in spoil materials and to relate this to fines generation and the effects on hydraulic conductivity and shear strength. The response of rockfill and spoil material to applied loading is discussed first. The implications for the long term behaviour of mine spoils are then reviewed. This section applies to the behaviour of durable rock and does not consider additional compression that could result from rock degradation (weathering).

#### 3.1.2 Compressibility

Settlement or compression in coarse granular fills can be divided into the following stages.

- compression during construction
  - particle crushing
  - particle rearrangement
- long term compression
  - additional crushing
  - additional particle rearrangement
- compression due to wetting
- compression due to softening/weathering (considered in the next chapter)

This study is concerned with post construction settlement. However, data on construction settlement is also included to provide a bound on the compression behaviour.

There is little information on the compressibility of spoil in waste dumps. There is a significant amount of information on rockfill behaviour in dam construction, including both field observations and laboratory testing. Waste dumps differ from dams in that spoils are not mechanically compacted and the rock is generally of poorer quality. However, dam construction prior to the early 1960's generally involved end dumped rockfill and this experience is pertinent to spoil piles. The available data from laboratory testing programs, although on compacted material, are also useful in identifying the general behaviour of rockfill.

In reviewing the results of laboratory compression tests, it is useful to appreciate the stress ranges that might be encountered in a typical BC mine spoil pile. A 200 m high dump face, with



a slope of  $37^\circ$ , on a natural grade of  $20^\circ$ , corresponds to a 104 m thickness of spoil below the crest. The corresponding vertical stress is approximately 2,000 kPa. If the natural slope is  $25^\circ$  then the vertical stress would be approximately 1,500 kPa.

### 3.1.2.1 Compressibility of Dry Rockfill

Marsal (1967) concluded that the most important factor affecting both the shear strength and compressibility of rockfill is the particle breakage that occurs during both uniform compression and shearing. The amount of particle breakage is related to the magnitude of the contact stresses, which are inversely proportional to the number of contacts. Uniform rockfill composed of large angular particles has fewer contacts which results in large contact stresses and higher compressibility than rockfill composed of smaller rounded particles or well graded material.

Rockfill compressibility depends on:

- **Gradation:** Uniform rockfills have fewer contacts and are more compressible than well graded rockfill.
- **Relative Density:** Loose packing provides low confinement to the particles and enhances crushing. It also allows more particle rearrangement.
- **Grain Size:** Large grains have higher contact stresses, more tendency to fracture and higher rock fill compressibility.
- **Angularity:** Angular grains are more easily broken than rounded grains and result in higher compressibility.
- **Rock Type and Strength:** Rock strength largely controls the amount of particle breakage and therefore the compressibility.
- **Wetting:** In most rockfills increased particle breakage is encountered when the rock is wetted.
- **Stress Path:** For a given confining stress, particle breakage increases with shear stress level, i.e. greater compressibility in triaxial test than in oedometer ( $K_0$  test) and isotropic compression tests.

Investigations into particle breakage have been carried out by Lee & Farhoom and (1967), Marsal (1967, 1973) and Hardin (1985). Marsal (1967) defined a particle breakage index,  $B_g$ , which is the sum of the differences in the percentage retained on each sieve before and after shear testing.  $B_g$  is therefore the percentage by weight that has undergone breakage.

The results of triaxial compression tests carried out on 3 compacted rockfill materials (basalt and gneiss) by Marsal (1967) are shown in Figure 3.1. It can be seen that the well graded material (Material #1) shows an initial particle breakage at low stress but that breakage does not increase with increasing stress. The uniformly graded material (Material 3) however shows significantly higher particle breakage which increases as the stress increases. These differences are considered to be due to the confining effect provided by the smaller particles in the well graded material. In the uniform material, the applied load is carried through the large particle contacts and the crushing progressively increases with load. This is shown in the overall compression curves. Material 1 displays very low compressibility. Material 3 shows significant compression. The effect of particle breakage on the material gradation is also shown in Figure 3.1.

Figure 3.2 shows the results of laboratory compression tests on weaker rocks used in UK dam projects (Penman and Charles, 1976). The tests were carried out on compacted samples of mudstone and sandstone. Comparison with measurements during dam construction confirmed that the laboratory compression curves were representative of field performance.

It is useful to consider how these results would correspond to the overall settlement of a rockfill structure. Considering a dam composed of compacted sandstone rockfill, it can be seen from Figure 3.2 that a vertical stress of 2,000 kPa at the base of the dam would correspond to a strain of 6.0 percent. Summing the respective compressive strains over a 100 m height gives an average strain of 4.1 percent (4 m settlement). Most of this would occur during construction but it does help to visualize and bound the amount of compression in a compacted rockfill.

For uncompacted rockfills, there is very little laboratory test data available in the literature. Sowers et al (1965) show the results of laboratory compression tests on loosely prepared rockfill samples (see Figure 3.3). At a vertical stress of 2,000 kPa these tests show compressive strains up to 8.0 percent. Parkin (1977) reviewed the results of compression tests on a variety of granular materials and indicated an upper strain for loose rockfill of 20 percent under a load of 3,300 kPa. These values suggest a compression of 8 to 12 percent for loosely dumped material under a stress of 2,000 kPa. Proportioning, as previously for a 100 m fill thickness, indicates an overall average compression of 5.5 to 8.0 percent. This corresponds to the compression that would occur during construction of a dump. Large settlements, observed during dump construction appear to be consistent with measurements in uncompacted rockfills.

The literature on early dumped rockfill dam construction is summarized in Cooke (1984), Clements (1984) and Sowers et al (1965). Data from 14 dams are summarized in Fig. 3.4. The period of observation extends to 30 years in some cases. The data indicates settlement up to 1.0 percent of fill height in the first 10 years. Clements (1984) suggests an upper bound of 3.0 percent for compression of dumped rockfill in the first 10 years. Closer examination of his

data, however, indicates all except one of the 18 case records show compression of 2.0 percent or less in the first 10 years.

The data in Figure 3.4 plots as straight lines on a settlement versus log time plot. Sowers et al introduced the parameter  $\alpha$  to represent the settlement (in percent of fill height) per log cycle of time. Values of  $\alpha$  for dumped dams ranged from 0.7 to 1.0 percent. To put this in perspective, an  $\alpha$  value of 1.0 percent, for a 100 m high rockfill dam, corresponds to settlement of 1 m in the first 10 years then another 1 m in the next 90 years. Killkenny (1968) monitored surface settlement at a restored opencast mining site in the U.K. and indicated  $\alpha$  of 0.74 for the uncompacted backfill.

Sowers et al considered the time dependent compression of rockfill to be due to continued local crushing of contact points giving local stress redistribution and slight particle rearrangement which in turn gives rise to additional crushing at new locations.

#### 3.1.2.2 Compression Due to Wetting

The importance of wetting in promoting compression of rockfills has long been realized and sluicing has been an integral part of rockfill placement in dumped rockfill dam construction. In coarse rockfills, the response to wetting reflects the decrease in uniaxial compressive strength that most rocks display on wetting. Charles and Watts (1980) indicate strength reductions of up to 50 percent on wetting. This is believed to be due to water entering microfissures and reducing the required fracture energy (Van Eeckout, 1976), a feature which may be more pronounced in the highly stressed localized contact points in rockfill. Sowers et al carried out one dimensional compression tests in the laboratory and found that the compression increased by 20 percent on wetting. In laboratory tests on compacted weak reef limestone (Brown, 1988), the strains essentially doubled when the loaded samples were wetted.

Terzaghi (1960) noted that dam settlements after impounding could be significant for soft rock fill (eg schist) whereas for harder granites, such settlements were generally small. This was based on experience with dumped rockfill dams. An example of this was the Dix River Dam. The sudden increase in settlement when the partially completed embankment was saturated by a flood is shown in Fig. 3.5 (Sowers et al, 1965). Another example is provided by the 85 m high Cogswell Dam in 1933. Sluicing was omitted in construction, and when the dam was 80 percent completed, exceptionally heavy rainfall caused the crest to settle by 4 percent of the embankment height (Terzaghi, 1960).

Some believed the major benefit of sluicing was in washing the fines from between the points of contact of the larger rock and thereby permitting the larger rock to develop more positive contacts. However, it is now generally accepted that the main benefit of wetting is the weakening of the rock as described above. Sowers et al's tests confirm this latter view since they measured the same compression regardless of whether the samples were jetted under pressure or merely wetted.

Since wetting produces a sudden increase in settlement as shown in Figure 3.5, Charles (1980) used the term 'collapse' settlement to describe the compression when loose unsaturated fill materials are inundated. This term, however, is not in general usage since it is easily confused with the collapse observed when loose, metastable silts and sand soils are saturated; a similar response but a different process.

Charles et al (1977, 1980) describe a study carried out at the Horsley pit in the UK, to investigate the effect of a rising groundwater table on 70 m of uncompacted mudstone and sandstone backfill. 'Collapse' compression was locally as large as 1.5 percent, although the compression averaged over the whole saturated zone was approximately 0.5 percent.

Seedsman and Williams (1987) have carried out laboratory tests on spoil materials from the Bowen Basin in Australia. Table 3.1 shows the results of their tests carried out with three different materials under different stress levels. The sandstones are described as remaining intact when immersed in water, the Permian mudstones are described as slaking but undergo limited dispersion in water, and the weathered clays are best described as undergoing a strong dispersion reaction. It is inferred that the strong sandstones and Permian mudstones correspond to spoil materials described here as non-cohesive spoils. The sandstones showed saturated settlement of 6-8% and the Permian mudstones exhibited much higher saturated settlements in the range 12-13%. Clearly these results conflict significantly with the much lower saturated compression values measured at the Horsley Pit. The difference may be partially due to the lower effective stresses in the Horsley Pit. The average vertical effective stress for fully saturated material in the Horsley Pit is estimated to be about 320 kPa. The lowest normal stress value in Table 3.1 is 500 kPa.

Lithology	Normal stress (MPa)	Settlement %	
		Dry	Saturation
Strong sandstones	0.8	7.5	8.0
	1.2	11.4	6.6
	1.6	15.0	6.4
Permian mudstones	0.5	11.0	13.4
	1.0	15.4	13.3
	1.5	19.7	11.7
Weathered clays	0.8	17.0	17.2
	1.2	23.5	9.6
	1.6	27.2	11.0

### 3.1.3 Particle Breakage and Fines Generation

An important effect of self weight compaction in coarse granular materials is particle breakage and the consequent generation of fines. Particle breakage can result in both strength loss and decreased hydraulic conductivity.

As discussed previously, Marsal (1967) examined particle breakage in rockfill materials and proposed a particle breakage index,  $B_g$ , to describe the amount of breakage before and after shearing. Marsal demonstrated that particle breakage increases with coarseness and decreases with grading. That is, coarser and more uniform rockfills are more prone to particle breakage than fine wide graded rockfills. On this basis it can be concluded that rock-like spoil materials will generate a higher proportion of fines than soil-like spoil.

Lee and Farhoomand (1967) have also examined the effects of particle breakage for materials of different grain sizes and grading. Figure 3.6 shows a summary of their findings where the amount of crushing is expressed as the ratio of the  $d_{15}$  size before and after testing. It is noted that the sandy gravel material (Soil F) are similar to soil-like spoils.

Figure 3.6 shows a significant increase in sand content (about 10%) at an isotropic consolidation stress level of  $80\text{kg/cm}^2$  (about 8,000 kPa). Lee and Farhoomand conclude however, that based on accepted filter criteria for granular media significant changes in permeability would not occur.

Williams and Walker (1985) show similar results to those of Lee and Farhoomand's Soil F when testing at confining pressures of 640 kPa. Testing of material classified as "good quality" waste rock shows an increase in sand content of less than 5% and testing of "poor quality" waste rock indicates an increase in sand content of about 10%. The latter test results show a considerable increase in the amount of silt sized particles generated due to crushing (about 15%).

## 3.2 ROCK DEGRADATION

### 3.2.1 General

Breakdown and weathering processes in rocks are usually classified under two headings:

- (a) Physical breakdown - disintegration of rock into smaller fragments
- (b) Chemical weathering - decomposition of mineral constituents

Both sets of processes are complementary, but inasmuch as physical breakdown increases surface area more rapidly, it may be regarded as acting as a control on chemical weathering (Taylor & Spears, 1970).

For sedimentary rocks, chemical weathering is less significant since the proportion of minerals susceptible to alteration may be small and the processes proceed relatively slowly. For example, Taylor and Spears (1970) indicate that most of the minerals in Coal Measures rocks in the UK have been through at least one cycle of weathering, transportation and deposition i.e. detrital in origin. Little change is therefore expected to occur under normal weathering conditions in a short number of years. However, non-detrital minerals, formed within the sediment (eg. pyrite) will break down more readily. Since these unstable minerals normally constitute only a small fraction of the total, the average rate of chemical change is slow; much slower than the rate at which physical disintegration can take place. Most of the literature seems to be related to the physical breakdown of argillaceous rocks.

### 3.2.2 Physical Breakdown

#### General

Processes of physical breakdown are summarized in Table 3.2. this section reviews some general background information before describing in more detail the two processes considered to be most important as in the physical breakdown of argillaceous mine spoil materials.

Weakly cemented sedimentary rocks, particularly mudrocks often associated with coal deposits, are prone to degradation when exposed to weathering agents and stress relief. The materials susceptible to such breakdown range from non-cemented, compaction shales ('clay shales') to cemented mudstones, siltstones and argillaceous sandstones. They cover a range of uniaxial compressive strengths in the order of 1 to 100 MPa.

The weathering conditions required to initiate breakdown vary in severity. Some materials breakdown on air exposure and fluctuations in humidity. Others require total immersion in water or cycles of wetting and drying. Others require one of the above conditions in combination with mechanical disturbance such as occurs during placement and compaction.

Over the last 25 years significant effort has been expended in trying to classify the durability of these materials and to link durability to simple index tests. From this it has been possible to recognize two types of non durable argillaceous rocks:

- very weak rocks that disintegrate into soil particles
- stronger, 'non-expandable' rocks that show swelling tendencies and breakdown to gravel size fragments.

MECHANISM		IMPORTANCE	REFERENCES	
1.	Handling, transportation and placement	Mechanisms when comparing in place dump ash plant	Thomson and Rodin (1972)	
2.	High stresses in dump.	Crushing in long term providing rock is not		
3.	Freeze/thaw action	Expanding on local climate		
4.	Confining stress relief	Released showed that effects due to strain may be related with strains due to changes in Lo (1958) strain York.	Harper et al (1979), Andrews et al (1980)	
5.	Reduced fracture energy with wetting	The effect of fracture vapour strength in mine shales showed this to be	Van Eeckhout (1976)	
6.	Capillary Action	1. Negative pore pressure increase on drying	Increased microcracks which weaken rock and tensile	Olivier (1979)
		2. Negative pore pressure decrease on wetting or humidity increase.	Decreased damages rock structure and was or in deterioration of Karoo	Olivier (1979)
		3. Lengthening of cracks	Suction	
		4. Pore air compression (air breakage)	Development of water in non expandable mudrocks in UK York sediments.	Taylor & Spears (1970), Olivier (1979), Harper et al (1979), Andrews et al (1980)
7.	Swelling Clay Minerals	1. Osmotic Swelling	Repulsion of UK Coal Measures rocks over clay. However, these swelling in the Coal Measures. Bowen Basin, Australia.	Taylor & Spears (1970), Seedsman (1986)
		2. Hydration	Water binding of clay shales the clay	Seedsman (1986)
8.	Crystal growth	Growth forces.		

- Notes: 1. Mechanisms 4 to 7 are applicable to argillaceous rocks.  
2. A discussion of most of the above mechanisms is given in the text.





Initial studies investigated the weak rocks that disintegrate to soil masses and were directed at establishing a distinction between 'soil-like' and 'rock-like' materials. Morgenstern and Eigenbrod (1974) concluded that a uniaxial compressive strength in excess of 3.5 MPa implies 'rock-like' behaviour. Grainger (1984) arrived at a similar conclusion based on an independent review of UK experience. Taylor (1988) modified this with the additional requirement that the Slake Durability Index be in excess of 60 percent for a 3 cycle test.

That the very weak mudrocks breakdown to soil sized particles is not surprising, particularly when the materials contain significant proportions of swelling clay minerals (mixed layer clays and smectite). These materials show significant swelling with moisture absorption which causes softening. However, what is surprising is that reasonably well indurated, "non-expandable" mudrocks, which consist mainly of stable lattice clay minerals (illite and kaolinite) and quartz, can also show significant volume changes in response to moisture variations. This swelling and shrinkage leads to breakdown of the material. This behaviour in "non-expandable" mudrocks has been documented in the Karoo mudrocks of the Orange Fish Tunnel in South Africa (Olivier, 1990), Ordovician mudrocks in Ontario, Canada and New York State (Grice, 1968; Harper et al 1979).

The soil-like distinction is useful in dealing with very weak mudrocks encountered in the UK, Australia and Prairie Coal mines. However, most of the rocks associated with BC Mines would have uniaxial compressive strengths in excess of 10 MPa. The major interest therefore resides in being able to predict whether these rocks will breakdown and to predict the products of the breakdown (i.e. soil or rock fragments).

### **Products of Breakdown**

Three basic levels of durability can be identified:

1. durable; does not break down
2. non-durable; breaks down to slabs, small rock fragments and chips
3. non-durable; breaks down to individual soil particles

The difference between Types 2 and 3 is significant since a rock that breaks down to gravel size particles may still be free draining whereas a mudrock that softens and breaks down to a clay soil will have very poor drainage characteristics.

Important observations in this regard are summarized in Andrews et al (1980). They looked at four spoil piles in the Appalachian coal fields. Based on field and laboratory testing they observed three modes of breakdown as summarized in Table 3.3.

TABLE 3.3 MODES OF ROCK BREAKDOWN IN APPALACHIAN SPOIL PILES (ANDREWS ET AL, 1980)			
Breakdown Mode	Description		Associated Rock Types
	Size	Fabric/weakness	
Slab or block slaking	slabs or blocks; 75 mm to 1800 mm	breakdown occurs along natural or blast induced fractures	Generally in sandstones and limestones; usually massive.
Chip slaking	flat fragments; thickness: 6 to 20 mm length: 25 to 150 mm	Initial breakdown occurs along subparallel planes of weakness (mainly bedding)	Generally in shales and siltstones. Bedding may be well defined or indistinct.
Slaking to inherent grain size	soil mass; sand or silt/clay particles	No apparent rock fabric	Generally in mudstones and occasionally in sandstones. Rocks are usually massive and maybe cemented

The materials investigated included mudstones ( $\sigma_c^1 = 1$  to 20 MPa), siltstones and shales ( $\sigma_c = 3$  to 30 MPa) and sandstone and limestone ( $\sigma_c = 40$  to 200 MPa).

Mudstones tended to disintegrate to individual grain size and form clay soils. The shales and siltstones, with closely spaced bedding planes, broke down to small chips. The sandstone showed very little breakdown.

The authors found that the proportion of 2 to 20 mm size fragments showed little variation with depth at all of the sites and suggested that breakdown of coarse fragments takes place rapidly, but further degradation apparently occurs at a much slower rate suggesting that these "chip" fragments have approached equilibrium with their environment. This may be due to chip slaking<sup>2</sup> occurring on natural lines of weakness in the fabric. The minimum size of the particles may be due to an absence of these features in the smaller particles.

One question is whether material that breaks down to chips in time will break down to individual grains. Andrews et al state that chips usually are relatively stable and resist further

1.  $\sigma_c$  = Uniaxial compressive strength.

2. The term slaking is commonly used in association with the breakdown of rocks when exposed to water and drying. However the term is somewhat ambiguous. For example, Andrews et al (1980) in describing eastern USA experience, use slaking to describe all the processes of physical breakdown included in Table 3.2. Whereas in the UK, Taylor (1988) uses slaking only to describe rock breakdown due to cyclic wetting and drying and restricts it to the pore air compression (air breakage) mechanism. Because of this ambiguity use of the term slaking is limited in this report.

degradation. In the laboratory the samples were exposed to five cycles of wetting and drying. Only one sample, a mudstone, displayed chip slaking and then disintegrated to a soil mass. Similar observations were noted in the field, where shales exposed to significant weathering action at ground surface, appeared stable as chip fragments and did not show a trend of softening to form a soil mass.

This issue was a concern in using weakly cemented shale fill for the construction of the Balderhead Dam in the U.K. (Kennard et al, 1967). This case history is discussed in more detail in Section 4.4. The material was 100 mm minus. The material degraded with cycles of wetting and drying. Breakdown ceased when a particle size of approximately 10 mm was reached. The material retained this frictional nature with physical weathering as confirmed from samples taken from the surface of an adjacent 50 year old dump. For this shale, it is only with chemical weathering, causing leaching of the cementation, that the shale chips degrade into a clay soil. In the body of a spoil pile it would appear that this is a very slow process.

Mitchell (1993) and Seedsman (1986) reported the results of slaking tests on clay shales and identified four modes of disintegration. These tests investigated soil-like mudrocks and emphasized the softening that occurs with moisture absorption and dispersion to form mud layers when fully immersed.

The main controls on breakdown have been identified by Taylor (1988) as:

1. Sedimentary structures - bedding planes, joints, laminations, microfractures
2. Cycles of wetting and drying giving air breakage
3. Swelling clay minerals.

Of major interest is the fact that slaking type disintegration occurs in "non expandable" mudrocks as well as those containing swelling clay minerals. Table 3.2 summarizes the mechanisms that have been described as being important mechanisms for physical breakdown of rocks. Capillary action and the presence of swelling clay minerals are the most commonly identified as the dominant mechanisms in causing mudrock breakdown. Accordingly they are discussed in more detail in the following:

#### 3.2.2.1 Capillary Action

Taylor and Spears (1970) described the pore air compression mechanism or air breakage which occurs as a result of capillary action as follows. During dry periods evaporation from the rock surface promotes high suctions. With extreme desiccation the bulk of the voids will be filled with air which on rapid immersion in water become pressurized by the capillary pressures developed in the outer pores. Failure of the mineral skeleton along the weakest plane ensues and an increased surface area is exposed to further events.

Taylor & Spears (1970) considered this to be the dominant process in material breakdown. In 1988, Taylor presented a somewhat modified view describing the material breakdown process as a gradual internal weakening in combination with pore air compression. He quotes the results of Van Eeckhout's (1976) tests on coal mine shales, where progressive lengthening of internal discontinuities was inferred, due to wetting and drying. This results in less fracture energy being required to fail the rock. Taylor concluded that given sufficient cycles of wetting and drying and the lengthening of internal discontinuities, failure would ultimately take place by 'air breakage'.

Seedsman (1986) indicated that the pore air compression mechanism would be most prevalent in materials with small pore sizes. However, the mechanism requires rapid buildup of air pressure caused by rapid advance of the wetting front. In finer grained clays, the low permeability and the presence of expansive clays likely restricts the process. Similarly, sandstones with larger void spaces are not susceptible.

The extensive observations and testing of Karoo mudrocks in the 82 km long Orange Fish Tunnel provides one of the best documented cases of deterioration in "non expandable" mudrocks. This experience is summarized in a series of papers by Olivier (1979, 1990).

The Karoo sequence encountered in the tunnel are of Lower Triassic age and comprise:

- Durable and non durable - muddy siltstone  
- silty mudstone
- Non durable - weakly cemented sandstone
- Durable - sandstone and siltstone.

Petrographic analysis indicated that the mudrocks contained very small quantities of swelling clays (mixed layer montmorillonite) and therefore can be classified as "non expandable" mudrocks. The uniaxial compressive strength typically ranged between 25 and 100 MPA, corresponding to low to medium strength rock.

Using classifications based on slake durability tests (Franklin and Chandra, 1972) indicated much of the rock to have a high durability rating. However, observations in the tunnel prior to placing the permanent concrete lining (3 to 4 year delay), indicated numerous locations of extensive spalling due to mudrock deterioration with time.

The moisture sensitive response of compacted mudrocks and weakly cemented sandstones was found to be highly variable. It did not correlate with mineralogy or grain size. Definite swelling and shrinkage strains were measured in the non durable rocks when subjected to:

1. continuous variation in humidity,
2. alternating wetting and drying cycles,
3. prolonged periods of intensive drying, followed by moisture absorption.

Olivier (1990) considered that rock deterioration was related to textural features; the degree of compaction and presence of microcracks. He considered the mechanism of deterioration to be due to capillary action. Periods of drying cause shrinkage and development of microcracks. Wetting causes swelling. The two processes produce differential strain and microcracking of the rock. The extent of such cracking and weakening being increased by the reduction in fracture energy (Van Eeckhout, 1976). Air breakage or pore air compression results in final breakdown of the material.

Olivier's results are consistent with findings by Skarzynska et al (1987) on the weathering of coal mine shales and claystone rocks in Poland. Samples were taken from an embankment at various times. They were initially 100 mm minus with  $D_{60}$  of 45 mm. Rapid disintegration to a  $D_{60}$  size of 5 mm occurred within the first year for samples at ground surface. Further particle reduction was negligible in the next 8 years. At a depth of 1.0 m the  $D_{60}$  size reduced to 20 mm after 2 years and remained constant for 8 years.

#### 3.2.2.2 SWELLING CLAY MINERALS

Swelling of clay shales that contain significant quantities of swelling clay minerals comprises two processes.

- **Osmotic Swelling:** Occurs in smectite clays particularly when the exchangeable sodium ion concentration is high. Low salt content water reduces the concentration of sodium ions and increases the repulsion forces between the clay particles. This causes swelling and in extreme cases complete breakdown to clay size particles.
- **Hydration:** Water molecules are absorbed into the crystal structure of the clay minerals.

Seedsman (1986) considers that hydration is not a significant factor in the swelling of clay shales. However, Taylor (1988) considers hydration or intraparticle swelling of mixed layer clay to be a major control on the breakdown of UK coal measures mudrocks.

Seedsman (1986) carried out an extensive series of tests on clay rich shales from the Bowen Basin in Australia. He indicated that the swelling of an unconfined clay shale is a result of the interaction between the internal swelling pressure and the intraparticle bonding (cementation); breakdown occurs when the internal pressure exceeds the capacity of the intraparticle bonding and the material fails in tension. He noted that disintegration occurred in lower density (higher water content) materials and that these parameters provide an indirect measure of the degree of intraparticle bonding (cementation). For Ca montmorillonite, only limited osmotic swelling developed. Breakdown developed in the lower density materials and resulted in a pile of rock fragments but it did not develop into disintegration to individual clay size particles. It should be noted that this was based on only one cycle of drying. In the Na montmorillonite, complete breakdown occurred with formation of a layer of dispersed clay.

Despite the UK coarse coal discards containing some 26 percent expandable mixed layer clays, Taylor (1978) reports negligible material breakdown below the surficial weathering zone (see case histories, Section 4.2). It appears that in spoil piles this potentially rapidly degradable material is more resistant to breakdown. Taylor indicates that there is some evidence that infers that organic matter may inhibit the intraparticle expansion process. He also indicates that the amount of mixed layer clays with exchangeable Na levels may be restricted. Also, it is possible that once in a spoil pile, intraparticle expansion may be restricted since Na in the interlayer structural sites could be subject to exchange by the readily available divalent cations from sulphates and carbonates. He reports that, in any case, the proportion of stronger non expandable rocks will tend to blanket the overall degree of spoil breakdown. This observation was also noted by Andrews et al (1980) for Appalachian coal mine spoils (see Section 4.3.1).

### **Durability Classification Systems**

Classification systems arise from the need in many civil engineering applications to be able to predict rock durability. Applications and conditions may vary, for example, building stone, tunnel walls, rock drain material, riprap, durable waste rock. The different conditions have led to a variety of laboratory testing methods involving different severities of test conditions.

Initial studies were directed at differentiating between rocks that displayed soil-like versus rock-like behaviour. Morgenstern and Eigenbrod (1974) concluded that a uniaxial compressive strength in excess of 3.5 MPA implies rock-like behaviour. Grainger (1984) arrived at a similar conclusion based on an independent review of UK experience. Taylor (1988) modified this to include a Slake Durability Index (SDI) greater than 60 percent based on a three cycle test.

Franklin and Chandra (1972) introduced the slake durability test to differentiate durable rock from non-durable soil-like material. The test comprises immersing the sample in water, rotating it in a drum and then drying the sample. The SDI is the percentage by weight retained on a 2 mm mesh after two cycles of testing. Franklin and Chandra recommended that an SDI of 90 percent or more implied durable rock.

The slake durability test was largely accepted by industry in the seventies but more recently has come under criticism. OSM (1992) indicates that federal and state technical specialists in the USA observed that shale rated as highly durable by slake durability testing disintegrated into fine material by the time of placement in spoil piles. One of the problems is that rock that breaks into chips or fragments, larger than 2 mm, can achieve a high SDI rating because the material is retained on the mesh. Similarly, mudballs formed from dispersed clay may be retained on the mesh. The duration of the testing interval may also restrict its usefulness.

Tests summarized in OSM (1992) concluded that the slake durability test lacks adequate discrimination to reveal durability differences between rocks of very dissimilar types. They also investigated the Deere and Gamble (1971) durability classification system and the Franklin

(1981) shale rating system and found a similar lack of differentiation. Olivier (1979) came to similar conclusions in trying to classify the mudrocks in the Orange Fish Tunnel in South Africa.

Confronted with these problems, researchers have proposed alternative approaches. Olivier (1979), recognizing the shrink/swell behaviour of non-expandable Karoo mudrocks, proposed a Geodurability classification that combines the results of free swell tests with the uniaxial compressive strength.

Andrews et al (1980) proposed a classification system comprising an initial measurement of the cation exchange capacity to measure dispersive tendencies, followed by a cyclic durability test (5 wet/dry cycles).

OSM (1992) proposed initial assessment using a jar slake test (24 hours immersion) followed by free swell test and point load index tests. This second stage is essentially the same as Olivier's Geodurability classification. Based on this OSM, recognizes three engineering-use categories of waste rock.

- Class I            Non durable and weak rock; not suitable in end dumped durable rock spoil piles.
- Class II           Rock of medium strength that is suitable for durable rock fills; however unsuitable for use in underdrains and head-of-hollow fills.
- Class III           Durable and strong rock; suitable for rock drains.

Dick and Shakoor (1994) take the view that durability and lithologic characteristics of mudrocks are highly variable and therefore no single lithologic characteristic can be used to predict durability of all types of mudrocks. Differentiating the mudrocks as claystones, mudstones, siltstones, shales and argillites reduces the lithologic variations they have proposed different durability classification criteria for the different mudrock types.

Vandre (1993) considered the properties of course durable rock for armouring and rock drain applications. He concluded that strength and porosity are the major indicators and that specific gravity and absorption tests provide a simple way of evaluating these properties.

### 3.2.3 Chemical Weathering

Chemical weathering is the alteration of rock minerals caused by the presence of air, water, and temperature increases. Loughnan (1969) describes three simultaneous processes involved in chemical weathering as follows:

1.     The breakdown of the parent material structure with the concomitant release of the constituent elements as ions or molecules.

2. The removal in solution of some of these released constituents.
3. The reconstitution of the residue with components from the atmosphere to form new minerals, which are in a stable or metastable equilibrium with the environment.

These mechanisms of chemical decomposition are summarized in Figure 3.7A. The main controls on the chemical weathering process and the response of rock materials to it are shown in Fig. 3.7B. Chemical weathering as a method of rock-material decomposition has much greater potential where the climatic regime is hot and wet and where weathering occurs over long periods of geological time. Within an engineering timescale (50 - 100 years) the most relevant chemical weathering processes are probably those of oxidation/reduction and solution (Fookes et al, 1988).

In all of these reactions the driving force behind the process is water. Physical breakdown is important because it increases the surface area exposed to chemical attack. Climate is important. At normal temperatures the reaction rates approximately double for each 10°C rise in temperature. Type of rainfall is important; short intense rains erode and runoff whereas light intensity long duration rains soak in and aid leaching. The relationship of physical and chemical weathering potential to climatic conditions is summarized in Fig. 3.8 from Ollier (1984).

In the case of sedimentary rocks, the minerals have usually experienced at least one cycle of weathering and have achieved some stability with respect to weathering. It is the new minerals, formed within the sediment after deposition, that are prone to chemical weathering. These are commonly carbonates (calcite,  $\text{CaCO}_3$ ; siderite,  $\text{FeCO}_3$ ) and sulphides (pyrite  $\text{FeS}_2$ ).

Taylor and Spears, (1970) indicated that these non detrital minerals are less significant in non-marine mudrocks than in marine types. For example, in the dominantly non-marine U.K. Coal Measures rocks, the proportion of pyrite is very low and carbonate exists in the stable siderite form rather than the easily weathered calcite form. In marine mud rocks of the USA, pyrite exists in higher proportions. In addition calcite is the normal cementing agent. In certain marine mudrocks dissolution of calcite has been cited as the principal cause of disintegration (Kennard et al, 1967; Tourtelot, 1962).

Taylor and Spears (1970) indicate that oxidation of sulphide minerals (mainly pyrite) is the most important chemical decomposition process in mudrock weathering profiles. The chemical reaction is complex and results in iron sulphate and sulphuric acid.

Although oxidation of pyrite involves expansion which can cause fracturing of adjacent mudrock, it is the products of the reaction which lead to mudrock breakdown. In particular, sulphuric acid reacts with calcite forming gypsum. Loss of calcite cementation and expansion of gypsum along bedding planes cause disintegration of the mudrock.



Because of the low proportions of non-detrital minerals in non-marine mudrocks, chemical weathering in the interior UK spoil piles has been found to be insignificant below the immediate surface zone (upper 2 m).

The redox reactions occurring within mine spoil piles containing sulphides are exothermic. Where air and moisture is readily available, significantly the heat that is generated due to oxidation can accelerate the weathering process. Temperatures up to  $65^{\circ}\text{C}$  have been measured at a depth of about 10 m in waste piles at the Golden Sunlight Mine in Montana (Smith et al, 1995). Rapid weathering may be most prevalent in rock-like spoils where air movement due to thermal advection is more likely. Moring (1991) provides some insight into this process. It is conceivable that rapid chemical weathering of this nature could cause a rock-like spoil to break down to a soil like spoil over a relatively short period of time (within the context of an engineering time scale).

### 3.3 SURFACE AND SEEPAGE EROSION

#### 3.3.1 Surface Erosion

Surface erosion of mine spoil piles occurs as a result of detachment and movement of soil by runoff. The combined influence of quantity of runoff, vegetative cover, soil properties, slope gradient and slope morphology determine the erosion potential of dump slopes. Surface runoff occurs only when precipitation or snow melt rates exceeds the rate at which water can infiltrate the soil. The combination of snow melt and frozen ground can result in high runoff volumes. If there is no runoff, there is no significant erosion. Most of the erosion observed on angle of repose slopes during operations or on dumps less than 50 years old at metal mines located in the western U.S. can be attributed to runoff from benches flowing onto the slopes below (Vandre, 1995).

Vegetative cover can reduce runoff velocities, bind soil particles with root mass and increase infiltration by detaining runoff and reducing the potential for environmental forces sealing the surface soils. For vegetation to effectively control erosion, cover density should be on the order of 60 to 70 percent (Copeland 1963) and runoff velocities should be less than 3 to 5 feet per second (NRC 1990). For uranium tailings, the Nuclear Regulatory Commission (NRC, 1990) considers vegetation is unreliable for controlling long term erosion at arid or semi-arid locations because of drought potential.

Chopiuk and Thornton (1987) conducted a short term (2 to 3 year) study at several Rocky mountain coal mines in Alberta. The study indicated that the average amount of surface erosion was minimal. Erosion was greatest on newly regraded slopes and negligible on revegetated slopes. In general, the amount of erosion decreased with time due to the initial loss of fine particles, the formation of a weathered surface, and increased vegetative cover.

Detailed studies of surface erosion rates for loosely tipped spoil cones in South Wales (Haigh, 1978) showed erosion rates varying between 5 to 8 mm per year.

Studies at the Jum Jungle Minesite in Australia (Daniel et al, 1983) tend to confirm the work carried out in Alberta. A detailed examination of a waste dump known as White's Dump showed that finer grained particles had been preferentially removed, leaving flat stones of 1 to 2 cm diameter. Apparently, precipitation initiated the migration of surficial finer particles into the spoil surface. Ricca (1979) also observed the migration of finer particles and noted that the removal of fines creates a relatively permeable "Outer Mantle" layer with a variable thickness in the range of 1-25 cm.

### 3.3.2 Seepage Erosion

Seepage erosion refers to instability of a porous medium due to high seepage. Geotechnical engineers normally consider three different processes; heave, piping, and internal erosion effects. Heave refers to upward movement of soil due to high seepage gradients. Piping is the internal removal of particles due to water exiting from a porous medium. Internal erosion or matri erosion is the process where finer particles migrate through a porous medium along with the water flow. It is considered here that this latter process is the most important one for considering long term geotechnical stability. Of particular interest is the potential for fine particles to concentrate with time in previously free draining portions of a waste pile forming a seepage barrier to further water movement. Comments here are confined to non-cohesive spoils.

Geotechnical engineers design against the movement of fines migration into granular drainage systems by incorporating intermediate filter layers. In order to control fines into the filter, the filter design is controlled by the well known relationship:

$$\frac{D_{15} \text{ (of filter)}}{D_{85} \text{ (of soil)}} < 4 \text{ to } 5 > \frac{D_{15} \text{ (of filter)}}{D_{15} \text{ (of soil)}}$$

The relationship assumes that the 15% size ( $D_{15}$ ) in filters will be small enough to hold the 85% size ( $D_{85}$ ) of adjacent soils in place and that finer soils will also be held in place due to a bridling effect (left side of the equation). The right side of the equation is meant to ensure that there will be sufficient permeability to prevent buildup of large seepage forces.

In addition to the above criteria, the filter should be a filter within itself and should contain less than 5% material passing the 200 mesh sieve. In order to meet the self filtering criteria it is recommended that:

$$\frac{D_{85} \text{ (of filter)}}{D_{15} \text{ (of filter)}} < 5$$

Inspection of the typical grain size distributions in Figures 2.1 and 2.2 reveals that mine waste rock is too widely graded to meet the self filtering criteria. Furthermore, typical sandy gravel materials are not filter compatible with coarser spoil containing cobbles and boulders. It is noted that non-impounding mine waste piles will not normally be subjected to the high hydraulic gradients evident for embankment dams for which these criterion have been developed. Nevertheless, the above discussion illustrates the potential for fines migration in a mine waste pile.

Skempton and Brogan (1994) have carried out tests to investigate piping in sandy gravels, following important contributions on experiments with granular filters by Kenney et al (1985) and Kenney and Lau (1985). Skempton and Brogan show that some "unstable" sandy gravel materials can exhibit piping at hydraulic gradients of one third to one fifth of the theoretical gradient for a homogeneous granular material of the same porosity. The explanation of this internal instability is that the coarser materials are carrying much of the overburden load and thus the finer particles are free to migrate.

Information on fines migration through mine spoil piles is scarce and limited to a few experiments and field observations. The following accounts provide some useful insights:

1. Whiting (1981) reports that internal migration of particles within preferential channels in waste dumps lead to clogging. He also stated that blow-outs can occur as water exits suddenly from a dump face. Presumably, the blow-outs result from water pressures and stored water volumes that back up behind clogged channels.
2. Joy (1990) conducted laboratory experiments and developed predictive mathematical simulations for flow through porous media similar to waste rock and valley fills. It was determined that internal fines migration was site specific and that mobility was most important below the water table.
3. Campbell (1986) has conducted field scale and laboratory model assessments of the downward migration of particles with vertically segregated (due to end dumping) Rocky Mountain coal mine waste. He maintains that the vertical segregation of particles down the dump face provides sufficient filter protection to ensure against downwards fines migration. Campbell also states that excavation work carried out in the toe area of a 14 year old waste dump at Fording Coal did not reveal any signs of fines migration.
4. Dawson and Morgenstern (1995) have noted that end dumped fills can contain fines layers oriented parallel to the dump face. These layers can be directly underlain by coarser material.

### 3.4 GEOTECHNICAL PROPERTIES AND LONG TERM PROCESSES

#### 3.4.1 Strength

The shear strength of granular materials depends on the following factors

- confining stress
- crushing strength
- relative density
- particle shape and size
- gradation
- degree of wetting

Leps (1970) has compiled data on the angle of shearing resistance ( $\phi$ ) varying with confining pressure of rockfill. Figure 3.9 shows this information for a range of rockfill materials ranging from high density, well graded strong particles to low density, poorly graded, weak particles. Indraratna et al (1993) provide a very useful summary of rockfill shear strength information by presenting rockfill data normalized to the uniaxial compressive strength of the rock particles. Figure 3.10 shows this information plotted on a log-log basis.

Williams and Walker (1985) have examined the effects of weathering on the shear strength of Panguna Andesite from the Bougainville mine in Papua New Guinea. Figure 3.11 show the results of their testing compared with the Leps findings for rockfill. Referring to Figure 3.11, Line 1 represents good quality fresh waste rock, Line A represents weathered good quality waste rock, and Line E represents weathered poor quality waste rock. Lines A and E plot below the lower bound strength range established by Leps. Williams and Walker attributed the lower strength values to a higher fines content due to weathering. There is some evidence that significant chemical breakdown occurs in the Panguna Andesite.

Seedsman et al (1988) have examined the effects of saturation and weathering on a range of materials from coal mines in the Bower Basin of Australia. Figure 3.12 shows their data for three different types of materials classified as cemented, poorly lithified, and weathered. The differences in shear strength due to saturation for the "slake-prone" poorly lithified materials and the "dispersive" weathered materials are represented by a decrease in friction angle of greater than  $10^\circ$ .

Shear strength results on samples from the body of the 50 year old Yorkshire main tip (see Section 4.2.2) showed negligible strength reduction due to time effects. Even in the surficial (1 m depth) zone of intense weathering, the value of the friction angle was reduced by only  $1.5^\circ$ . However, Taylor (1978) shows some evidence of strength reduction due to saturation effects from the Kellingley coal mine in Yorkshire as follows.

	<u>Friction Angle</u>
Compacted material above water table	35°
Uncompacted, below water table, 2.5 m depth, 8 years old	34.5°
Uncompacted, subject to fluctuating water level, 2.2 m depth, 8 years old	28.5°

Taylor concludes that there may be a narrow zone immediately above the water table in which chemical changes take place.

The fairly limited information presented above combined with the discussion of processes presented in this chapter suggest the following relatively unverified conclusions:

1. The shear strength of both rock-like and non-cohesive soil-like spoils could increase slightly due to compaction (especially from wetting) and decrease due to weathering.
2. For non-cohesive spoils, most weathering occurs due to wetting and drying and oxidation near the surface. Testing of near surface weathered materials indicates that decreases in friction angle in the order of about 5° are apparent.
3. The shear strength of cohesive soil-like spoils can decrease dramatically (> 10°) due to weathering as a result of wetting induced softening.

### 3.4.2 Hydraulic Conductivity and Infiltration Capacity

The hydraulic properties of mine spoils varies widely as might be expected considering the variability of grain sizes shown in Figure 2.2. Morin (1991) reports values of hydraulic conductivity varying between 1 cm/sec for igneous/metamorphic rock to as low as  $10^{-7}$  cm/sec for clayey basaltic andesite. The distinction between soil-like and rock-like spoil provides a useful break between lower and higher permeability spoil materials respectively.

Table 3.4 shows some typical saturated hydraulic conductivity values measured in soil-like spoil piles and compacted shale dams derived from the literature. These values are typical of soil-like spoil materials with hydraulic conductivities mostly less than about  $10^{-2}$  cm/sec. Table 3.5 shows that the hydraulic conductivity of soil-like spoil materials is strength influenced by compaction.

Results of field and laboratory tests in non-cohesive soil-like BC spoil piles (Dawson and Morgenstern, 1995) are shown in Figure 3.13. This figure shows that saturated hydraulic conductivity values are generally within the range  $10^{-4}$  to  $10^{-2}$  cm/sec and that hydraulic conductivity decreases with decreasing void ratio. It is noted that this range of permeability values are normally associated with finer non-gravelly materials, the very low void ratios are